

TABLE OF CONTENTS

DIVISION 1 - GENERAL REQUIREMENTS

01010	Summary of Work
01310	Project Meetings
01320	Schedules and Monthly Inspections.....
01330	Submittals
01360	Accident Prevention
01420	Reference Standards
01510	Temporary Services.....
01525	Construction Aids
01560	Temporary Controls.....
01600	Material and Equipment
01770	Project Closeout.....
01785	Operation and Maintenance Data.....

DIVISION 2 - SITE WORK

02224	Selective Demolition
02320	Utility Trenching and Backfilling
02502	Utility Line Marking.....

DIVISIONS 3 -14

NONE

DIVISION 15 - MECHANICAL

15010	General Mechanical Provisions.....
15050	Basic Materials and Methods
15075	Mechanical Identification.....
15080	Mechanical Insulation
15198	Small LP Gas Systems.....
15400	Plumbing Systems
15500	Hydronic Systems.....
15510	Boilers
15760	Hydronic Terminal Heating Units
15952	Testing, Adjusting and Balancing

DIVISION 16 - ELECTRICAL

16010	Electrical Provisions
16050	Basic Materials and Methods

SECTION 01010
SUMMARY OF WORK

PART 1 - GENERAL

I. DESCRIPTION

The scope of this contract includes:

- A. Furnish and install propane hot water baseboard heating systems, including boilers, baseboard and water heaters in 4 two bedroom apartments in Building 188, Schoodic Shores Apartments.
- B. The Contractor shall furnish all labor, materials, equipment, tools, transportation services and supplies required to complete the work in accordance with the specifications and drawings in this solicitation.
- C. Detailed scope description is in SECTION 15010
- D. All work will be performed under a single contract.
- E. Site will be available for work upon award and work must be completed before December 31, 2008.

II. LOCATION: Acadia National Park, Winter Harbor, Maine.

III. CONTRACTOR'S USE OF PREMISES

- A. Construction Camp: Establishment of a camp within the Park will not be permitted.
- B. Storage areas for materials and staging areas at the work site will be identified by the Contracting Officer.
- C. Preservation of natural features and protection of facilities: Confine all operations to work limits of the project. Prevent damage to natural surroundings and adjacent structures. Restore damaged areas, repairing or replacing damaged trees, plants, and facilities at no additional expense to the Government.
- D. Hauling Restrictions: Comply with all legal load restrictions in the hauling of materials.

IV. SPECIAL CONSTRUCTION REQUIREMENTS

- A. Contractor must maintain access to the building. Contractor must maintain utilities to the rest of the building except for brief outages coordinated in advance.
- B. Contractor must coordinate at least two weeks in advance for installation in one occupied apartment.
- C. Contractor will sequence work in such a manner to prevent damage to apartments or their contents due to freezing during the installation process.
- D. The government's propane provider is Dead River Company. Coordinate with the fuel provider to assure a complete and functional fuel system installation.

V. FIELD VERIFICATION

- A. Field verify all new and existing dimensions affecting the work of this contract before ordering products or performing work at the site.

VI. CONSTRUCTION MATERIALS

- A. All new materials shall be Contractor-furnished from outside the Park unless otherwise approved.

VII. PUBLICATIONS CITED

- A. All publications, references, codes, or standards cited in this specification, regardless if dated or not, shall be the latest published edition. Those that are superseded shall be governed by the superseding document.

VIII. WORKMANSHIP

- A. Unless directly specified otherwise, all materials, fabrications and work shall be installed/applied/completed in accordance with manufacturer's instructions/recommendations, state of Maine Regulations, and applicable International Codes. Notify Contracting Officer when impossible to comply.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 01310

PROJECT MEETINGS

PART 1 GENERAL

1.1 I. PRECONSTRUCTION CONFERENCE

A. Before start of construction, Contracting Officer will hold a meeting with Contractor. The meeting agenda will include the following as a minimum:

1. Correspondence procedures
2. Designation of responsible personnel
3. Labor standards provisions
4. Payroll reports
5. Changes
6. Payments to Contractor
7. Subcontractors
8. National Park Service regulations
9. Accident prevention program (including name of responsible supervisor)
10. Accident reporting
11. Contractor's Quality Control Program
12. Documents required under the contract
13. Park rules and regulations
14. Recycling Program
15. Saturday, Sunday, holiday and night work
16. Safety program (compliance with the "Accident Prevention" clause of the contract)
17. Cultural Survey and Natural Resource Compliance requirements for off-site, non-commercial borrow pits (compliance with "Cultural Resources Survey" clause of the contract)
18. Tentative construction schedule
19. Submittal of shop drawings, project data, samples, and approved equals
20. Project closeout requirements

21. Relationship of Division 1 to other divisions

1.2 II. PROGRESS MEETINGS

- A. The Contracting Officer will schedule weekly meetings with the Contractor and subcontractors.
- B. Subcontractors will not be allowed to work until they have attended a meeting.
- C. Additional meetings will be held as needed or for new subcontractors.
- D. The meeting agenda will include the following as a minimum:
 - 1. Review of work progress
 - 2. Field observations, problems, and decisions
 - 3. Identification of problems which impede planned progress
 - 4. Review of Contractor's Quality Control Program and activities
 - 5. Review of submittals schedule and status of submittals
 - 6. Review of off-site fabrication and delivery schedules
 - 7. Status of project record drawings (monthly)
 - 8. Status of operation and maintenance data manuals (monthly)
 - 9. Maintenance of progress schedule
 - 10. Corrective measures to regain projected schedules
 - 11. Planned progress during succeeding work period
 - 12. Coordination of projected progress
 - 13. Maintenance of quality and work standards
 - 14. Effect of proposed changes on progress schedule and coordination
 - 15. Other business relating to work

PART 2 – PRODUCTS

Not used.

PART 3- EXECUTION

Not used.

END OF SECTION

SECTION 01320

SCHEDULES

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of schedule requirements before and during construction.

1.2 SCHEDULES

1. If progress payments are desired, submit as soon as possible after Notice of Award and before beginning any work, a Schedule of Values. The Schedule of Values will form the basis for progress payments as provided for in the terms of the contract. No progress payments will be made until an acceptable Schedule of Values is provided. If a Schedule of Values is not received only a final payment invoice will be processed.
2. The Contracting Officer will review the Schedule of Values for format and content.
 - a. Show each bid item and area of work and break down work into the smallest element.
 - b. Include bond costs, mobilization, general condition costs, overhead and profit, in the total dollar value of each price item.
 - c. The total cost of all items shall equal the contract sum.

PART 2 PRODUCTS NOT USED.

PART 3 EXECUTION NOT USED.

END OF SECTION

SECTION 01330

SUBMITTALS

PART 1 - GENERAL

I. DESCRIPTION

- A. The work of this section consists of submittal requirements before and during construction.

II. RELATED REQUIREMENTS

- A. Closeout submittals - Section 01770.

III. SUBMITTAL AND APPROVAL PROCEDURES

- A. All submittals shall be transmitted using National Park Service form CM 16 unless otherwise directed. (A copy of the form follows this Section.) No action will be taken on a submittal item unless accompanied by the transmittal form.
- B. As specified in the individual sections, forward submittals to Contracting Officer at least 7 days before need for approval. Unless a different number is specified, submit one reproducible original and 2 copies of each shop drawing, 2 copies of manufacturer's catalog sheets (cut sheets), three specimens of each sample, and three copies of all other submittals requested.
 - 1. Shop Drawings: Include the following information with each copy of shop drawings:
 - a) Date.
 - b) Date of revisions (when applicable).
 - c) Contractor's certification that shop drawing has been checked for compliance with contract documents.
 - d) Details of fabrication, assembly and erection including connections and engagement to contiguous work.
 - e) Materials used.
 - f) All required dimensions.
 - g) The term "by others" shall not be used. All work to be performed by others shall be identified by Contractor or subcontractor name, discipline, or trade.
 - 2. Samples: Samples shall be large enough to illustrate clearly the functional characteristics and full range of color, texture, or pattern.
 - 3. Manufacturers' Catalog Sheets: Submit only pertinent pages; mark each copy of standard printed data to identify specific products proposed for use. MSDS sheets must accompany catalog sheets.
 - 4. Manufacturer's Installation Instructions: When contract documents require compliance with manufacturer's printed instructions, provide one complete set of

instructions for Contracting Officer and keep another complete set of instructions at the project site until substantial completion.

- C. Contracting Officer reserves the right to require submittals in addition to those called for in individual sections.
- D. Approved Equivalents:
 - 1. For each item proposed as an "approved equivalent," submit supporting data, including:
 - a) Drawings and samples as appropriate.
 - b) Comparison of the characteristics of the proposed item with that specified.
 - c) Changes required in other elements of the work because of the substitution.
 - d) Name, address, and telephone number of vendor.
 - e) Manufacturer's literature regarding installation, operation, and maintenance, including schematics for electrical and hydraulic systems, lubrication requirements, and parts lists. Describe availability of maintenance service, and state source of replacement materials.
 - 2. A request for approval constitutes a representation that Contractor:
 - a) Has investigated the proposed item and determined that it is equivalent or superior in all respects to that specified.
 - b) Will provide the same warranties for the proposed item as for the item specified.
 - c) Has determined that the proposed item is compatible with interfacing items.
 - d) Will coordinate the installation of an approved item and make all changes required in other elements of the work because of the substitution.
 - e) Waives all claims for additional expenses that may be incurred as a result of the substitution.
 - 3. Construction Materials: The Contractor is encouraged to submit for approval products made out of recycled or environmentally responsible material. Every effort will be made by the National Park Service to approve these materials.
- E. Coordinate all submittals and review them for legibility, accuracy, completeness, and compliance with contract requirements. Forward submittals that are related to or affect one another as a package to facilitate coordinated review. Each transmittal shall contain only data specific to that individual submittal.
- F. Submittal Identification:
 - 1. Identification shall include the park name, project title, contract number, and transmittal number.
 - 2. All sets of shop drawings, manufacturer's catalog sheets, samples, and other documents submitted to the Contracting Officer must have the identification information on the submittal.
 - 3. Identification information shall be applied to the bottom right margin on each page. Identification information on samples shall be applied to the most readily visible area on the sample or on tags attached to sample.
- G. Submittal Numbering:
 - 1. Number each submittal consecutively.

2. For re-submittals use the original submittal number, plus a letter suffix beginning with A.
3. Additional re-submittals of the same item shall contain the original number with the next consecutive letter.

H. Contracting Officer's Review:

1. Submittals will be returned disapproved without technical review if identification information is missing, not filled in, or if placed on the back of the submittal; an incorrect number or format of submittals is provided; the transmittal form is incorrectly filled out; submittals are not coordinated; or submittals do not show evidence of Contractor's approval.
2. Any work done or orders for materials or services placed before approval shall be at the Contractor's own risk.
3. After reviewing submittals, the Contracting Officer will return one copy of form CM-16 and one copy of applicable (marked up) submittal sheets to the Contractor. Shop drawing review notations will be returned on the reproducible original shop drawing. All other submitted items will be retained. The Contractor is responsible for producing additional copies for his/her own use.
4. The returned submittal will be marked in one of three ways as defined below:
 - a) APPROVED: Acceptable with no corrections.
 - b) APPROVED WITH NOTATIONS: Minor corrections or clarifications required. All comments are clear and no further review is required. The Contractor shall address all review comments when proceeding with the work.
 - c) DISAPPROVED - RESUBMIT: Rejected as not in accordance with the contract or as requiring major corrections or clarifications. The Contracting Officer will identify the reasons for disapproval. The Contractor shall revise and resubmit with changes clearly identified.

PART 2 – PRODUCTS

Not used.

PART 3- EXECUTION

Not used.

END OF SECTION

TRANSMITTAL - NATIONAL PARK SERVICE					Transmittal No.: Sheet: 1 of:			
Park:		Project:	Contract No.:		PMIS No.:		Date:	
Contractor:		Subcontractor/Supplier:			NPS ACTION			
Item No.	Specification Section No.	Paragraph No.	Description of Item (Size, Type, Name, Manufacturer, Use, Etc.)	No. of Copies Submitted	No. of Copies Returned	Approved	Approved with Notations	Disapproved - Resubmit
Contractor Signature				Recommended by				
Title, Date				Title			Date	
I hereby certify that this submittal has been reviewed for accuracy, completeness, and compliance with contract requirements (FAR 52.236-21)								
Review Comments				Action By			Date	
				Contracting Officer's Representative				
				Approval of this submittal is subject to the provisions of the contract drawings and specifications. This action is for general concurrence only and the Government is not responsible for errors or omission.				
SUBMITTAL LOG DATES: From contractor [], To reviewer [], From reviewer [], To Contractor []								
Distribution: () Contractor () DSC File () COR () A/E () DSC Interim () COR Interim () Contractor Interim								

TRANSMITTAL CONTINUATION - NATIONAL PARK SERVICE						Transmittal No.:		
Park:		Project:	Contract No.:			Sheet: 1	of:	
Contractor:		Subcontractor/Supplier:				PMIS No.:	Date:	
						NPS ACTION		
Item No.	Specification Section No.	Paragraph No.	Description of Item (Size, Type, Name, Manufacturer, Use, Etc.)	No. of Copies Submitted	No. of Copies Returned	Approved	Approved with Notations	Disapproved - Resubmit
Review Comments								

SECTION 01360

ACCIDENT PREVENTION

PART 1 GENERAL

I. DESCRIPTION

- A. The work of this section consists of establishing an effective accident prevention program and providing a safe environment for all personnel and visitors.

II. SUBMITTALS

- A. Accident Prevention Program: Before on-site work begins, submit for approval an accident prevention program. The Contracting Officer will review the proposed program for compliance with OSHA and project requirements. If the program requires any revisions or corrections, the Contractor shall resubmit the program within 10 days. No progress payments will be made until the program is approved. The program shall include:
 - 1. Name of responsible supervisor to carry out the program.
 - 2. Weekly and monthly safety meetings.
 - 3. First aid procedures.
 - 4. Outline of each phase of the work, the hazards associated with each major phase, and the methods proposed to ensure property protection and safety of the public, National Park Service personnel, and Contractor's employees. Identify the work included under each phase by reference to specification section or division numbers.
 - 5. Training, both initial and continuing.
 - 6. Planning for possible emergency situations, such as floods, fires, cave-ins, slides, explosions, power outages, and wind storms. Such planning shall take into consideration the nature of construction, site conditions, and degree of exposure of persons and property.
 - 7. Fire Protection: Section 01510.
- B. Certificates: When requested, provide certificates from a mechanic that all mechanical equipment has been inspected and meets OSHA requirements.
- C. Submit a copy of test reports, as required by OSHA, for personnel working with hazardous materials.
- D. Submit a report of safety meetings and of inspections.
- E. Upon request, submit proof of employees' qualifications to perform assigned duties in a safe manner.

III. QUALITY ASSURANCE

- A. In case of conflicts between Federal, State, and local safety and health requirements, the most stringent shall apply. Equipment or tools not meeting OSHA requirements will not be allowed

on the project sites. Failure to comply with the requirements of this section and related sections may result in suspension of work.

B. Qualifications of Employees:

1. Ensure that employees are physically qualified to perform their assigned duties in a safe manner.
2. Do not allow employees to work whose ability or alertness is impaired because of drugs, fatigue, illness, intoxication, or other conditions that may expose themselves or others to injury.
3. Operators of vehicles, mobile equipment, hoisting equipment, and hazardous plant equipment shall be able to understand signs, signals, and operating instructions, and be capable of operating such equipment. Provide operating instructions for all equipment. Newly hired operators shall be individually tested by an experienced operator or supervisor to determine if they are capable of safely operating equipment.

IV. ACCIDENT REPORTING

- A. Reportable Accidents: A reportable accident is defined as death, occupational disease, traumatic injury to employees or the public, property damage by accident in excess of \$100, and fires. Notify Contracting Officer immediately in the event of a reportable accident. Within 3 days of a reportable accident, fill out and forward to the Contracting Officer the attached SMIS offline accident reporting worksheet.
- B. All Other Accidents: The Contractor shall report all other accidents to the Contracting Officer as soon as possible and assist the Contracting Officer and other officials as required in the investigation of the accident.

PART 2 PRODUCTS

I. FIRST AID FACILITIES

- A. Provide adequate facilities for the number of employees and the type of construction at the site.

II. PERSONNEL PROTECTIVE EQUIPMENT

- A. Meet requirements of NIOSH and MSHA.

III. BARRIERS

- A. Section 01525.

PART 3 EXECUTION

I. EMERGENCY INSTRUCTIONS

- A. Post telephone numbers and reporting instructions for ambulance, physician, hospital, fire department, and police in conspicuous locations at the work site.

II. EGRESS

- A. Provide and maintain adequate egress at all times in accordance with the Life Safety Code (NFPA 101-94). No corridor, aisle, stairway, door, or exit shall be obstructed or used in a manner that interferes with egress.

III. PROTECTIVE EQUIPMENT

- A. Inspect personal protective equipment daily and maintain in a serviceable condition. Clean, sanitize, and repair, as appropriate, personal items before issuing them to another individual.
- B. Inspect and maintain other protective equipment and devices before use and on a periodic basis to ensure safe operation.

IV. SAFETY MEETINGS

- A. As a minimum, conduct weekly 15-minute "toolbox" safety meetings. These meetings shall be conducted by a foreman and attended by all construction personnel at the work site.
- B. Conduct monthly safety meetings for all levels of supervision. Notify the Contracting Officer of meeting dates and times. These meetings shall be used to review the effectiveness of the Contractor's safety effort, to resolve current health and safety problems, to provide a forum for planning safe construction activities, and for updating the accident prevention program. The Contracting Officer will attend the meeting and enter the results of the meetings into the daily log.

V. HARD HATS AND PROTECTIVE EQUIPMENT AREAS

- A. A hard hat area will be designated by the Contracting Officer. The hard hat area shall be posted by the Contractor in a manner satisfactory to the Contracting Officer.
- B. It is the Contractor's responsibility to require all those working on or visiting the site to wear hard hats and other necessary protective equipment at all times.

VI. TRAINING

- A. First Aid: Provide adequate training to ensure prompt and efficient first aid.
- B. Hazardous Material: Train and instruct each employee exposed to hazardous material in safe and approved methods of handling and storage. Hazardous materials are defined as explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful substances that could cause death or injury.

END OF
SECTION



Offline Accident Reporting Worksheet

(Preparation for reporting online via WWW.SMIS.DOI.GOV)

Factual Information about the Accident

Date / /	Reporter's/Supervisor's Name	Last 4
Time : AM PM	Place/Location of Accident	
Zip Code	Narrative	
Result <input type="checkbox"/> Injury <input type="checkbox"/> Illness <input type="checkbox"/> Injury w/Prop Damage <input type="checkbox"/> Property Damage Only <input type="checkbox"/> Incident Only		

Contributing Factors

Unsafe Act	Unsafe Condition	Management Factor
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Personal Data

Name	Last	First	MI
Attributes	SSN	DOB / /	Sex Occ Code Grade/Step
Address	Street	State	Zip Code
Organization	Bureau Code	Sub-Bureau Code	Organization Code
Empl Status	<input type="checkbox"/> Perm <input type="checkbox"/> Temp <input type="checkbox"/> Emer <input type="checkbox"/> Contr <input type="checkbox"/> Concess <input type="checkbox"/> Public <input type="checkbox"/> Volunteer <input type="checkbox"/> Firefighter <input type="checkbox"/> BIA Other		

Injury Information

Body Part	Date Work Stopped / /
Severity	Date Pay Stopped / /
Nature	Date Terminated / /
Type	Date Returned / /
Activity	45 Days Comp Began / /
Cause	Days Restricted Duty
Source	Days Lost Time

Property Damage Information

Prop Type	
Description	
Prop Owner	
Cause of Damage	
Source of Damage	
Cost/Loss	
Respon for Prop	SSN Name (use personal data block above or another form)

Additional Notes

Contract #:	
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SECTION 01420

REFERENCE STANDARDS

PART 1 - GENERAL

- I. The following abbreviations, which may be used in the construction specifications, refer to the organizations and specifications of the organizations listed below:

AA	Aluminum Association 900 19th Street, NW, Suite 300 Washington, D.C. 20006-2168
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, D.C. 20005
AAMA	American Architectural Manufacturers Association 1827 Walden Office Square, Suite 104 Schaumburg, Illinois 60173-4268
AAN	American Association of Nurserymen 1250 I Street, NW, Suite 500 Washington, DC 20005
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, NW, Suite 249 Washington, D.C. 20001
ABMA	American Boiler Manufacturers Association 950 N. Glebe Road, Suite 160 Arlington, Virginia 22203-1824
ACI	American Concrete Institute P.O. Box 9094 Farmington Hills, Michigan 48333-9094
ACPA	American Concrete Pipe Association 222 West Las Colinas Boulevard, Suite 641 Irving, Texas 75039-5423
ADC	Air Diffusion Council 11 South LaSalle Street, Suite 1400 Chicago, Illinois 60603
AFPA	American Forest and Paper Association 1111 19th Street, NW, Suite 800 Washington, D.C. 20036
AGA	American Gas Association 1515 Wilson Boulevard Arlington, Virginia 22209
AHA	American Hardboard Association 1210 W. Northwest Highway Palatine, Illinois 60067-1897
AHAM	Association of Home Appliance Manufacturers 20 N. Wacker Drive, Suite 1500 Chicago, Illinois 60606

AI	Asphalt Institute Research Park Drive P.O. Box 14052 Lexington, Kentucky 40512-4052
AISC	American Institute of Steel Construction 1 East Wacker Drive, Suite 3100 Chicago, Illinois 60601-2001
AISI	American Iron and Steel Institute 1101 17th Street, NW Washington, D.C. 20036-4700
AITC	American Institute of Timber Construction 7012 S. Revere Parkway, Suite 140 Englewood, Colorado 80112
ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, Maryland 20875
AMCA	Air Movement and Control Association International, Inc. 30 W. University Drive Arlington Heights, Illinois 60004-1893
ANSI	American National Standards Institute 11 West 42nd Street, 13th Floor New York, New York 10036
APA	American Plywood Association P.O. Box 11700 Tacoma, Washington 98411-0700
APWA	American Public Works Association 106 West 11th Street, Suite 1800 Kansas City, Missouri 64105-1806
ARI	Air-Conditioning and Refrigeration Institute 4301 Fairfax Drive, Suite 425 Arlington, Virginia 22203
ARM	Asphalt Roofing Manufacturers Association Center Park, 4041 Powder Mill Road, Suite 404 Calverton, Maryland 20705
ASC	Adhesive and Sealant Council 1627 K Street, NW, Suite 1000 Washington, D.C. 20006-1707
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, Georgia 30329-2305
ASLA	American Society of Landscape Architects 4401 Connecticut Avenue, NW Fifth Floor Washington, D.C. 20008-2369
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, New York 10017

ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Boulevard, Suite 210 Westlake, California 91362-3649
ASSE	American Society of Sanitary Engineering P.O. Box 40362 Bay Village, Ohio 44140
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive West Conshohocken, Pennsylvania 19428-2959
AWI	Architectural Woodwork Institute 1952 Isaac Newton Square Reston, Virginia 20190
AWPA	American Wood-Preservers' Association 3246 Fall Creek Highway, Suite 1900 Granbury, Texas 76049-7979
AWPI	American Wood Preservers Institute 1945 Old Gallows Road, Suite 550 Vienna, Virginia 22182
AWS	American Welding Society, Inc. 550 NW LeJeune Road P.O. Box 351040 Miami, Florida 33126
AWWA	American Water Works Association 6666 W. Quincy Avenue Denver, Colorado 80235
BHMA	Builders Hardware Manufacturers Association, Inc. 355 Lexington Avenue, 17th Floor New York, New York 10017-6603
BIA	Brick Institute of America 11490 Commerce Park Drive Reston, Virginia 22091-1525
BOCA	Building Officials Code Administrators 4051 W. Flossmoor Road Country Club Hills, Illinois 60478-5795
CBM	Certified Ballast Manufacturers 1422 Euclid Avenue, Suite 402 Cleveland, Ohio 44115-2851
CDA	Copper Development Association, Inc. 260 Madison Avenue, 16th Floor New York, New York 10016-2401
CE	Corps of Engineers (Chief of Engineers – Referral, U.S. Department of the Army) Washington, D.C. 20314
CID	Commercial Item Description See General Provisions

CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Road, Suite 419 Chattanooga, Tennessee 37421
CLFMI	Chain Link Fence Manufacturers Institute 9891 Broken Land Parkway, Suite 300 Columbia, Maryland 21046
CRA	California Redwood Association 405 Enfrente Drive, Suite 200 Novato, California 94949
CRI	Carpet and Rug Institute Box 2048 Dalton, Georgia 30722-2048
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, Illinois 60173-4758
CS	Commercial Standard of NBS (U.S. Department of Commerce) Government Printing Office Washington, D.C. 20402
CSSB	Cedar Shingle and Shake Bureau 515 116th Avenue, NE, Suite 275 Bellevue, Washington 98004-5294
DHI	Door and Hardware Institute 14170 Newbrook Drive Chantilly, Virginia 22021-2223
EPA	Environmental Protection Agency 401 M Street, SW Washington, D.C. 20460
FHA	Federal Housing Administration (U.S. Department of Housing and Urban Development) 451 7th Street, SW Washington, D.C. 20410
FHVA	Fine Hardwood Veneer Association 260 S. First Street, Suite 2 Zionsville, Indiana 46077
FM	Factory Mutual System 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, Massachusetts 02062-9102
FS	Federal Specifications See General Provisions
GA	Gypsum Association 810 First Street, NE, Suite 510 Washington, D.C. 20002
GANA	Glass Association of North America 3310 SW Harrison Street Topeka, Kansas 66611-2279

HI	Hydronics Institute 35 Russo Place P.O. Box 218 Berkeley Heights, New Jersey 07922
HMA	Hardwood Manufacturers Association 400 Penn Center Boulevard, Suite 530 Pittsburgh, Pennsylvania 15235-5605
HPMA	Hardwood Plywood Manufacturers Association P.O. Box 2789 Reston, Virginia 22090-2789
IA	Irrigation Association 1911 N. Fort Myer Drive, Suite 1009 Arlington, Virginia 22209-1630
ICBO	International Conference of Building Officials 5360 S. Workman Mill Road Whittier, California 90601
ICEA	Insulated Cable Engineers Association, Inc. P.O. Box 440 South Yarmouth, Massachusetts 02664
IEEE	The Institute of Electrical and Electronics Engineers 345 E. 47th Street New York, New York 10017-2394
IES	Illuminating Engineering Society of North America 120 Wall Street, 17th Floor New York, New York 10005-4001
IGCC	Insulating Glass Certification Council 3393 Route 11, Industrial Park P.O. Box 2040 Cortland, New York 13045-0950
ILIA	Indiana Limestone Institute of America, Inc. Stone City Bank Building, Suite 400 Bedford, Indiana 47421
KCMA	Kitchen Cabinet Manufacturers Association 1899 Preston White Drive Reston, Virginia 22091-4326
LIA	Lead Industries Association, Inc. 295 Madison Avenue New York, New York 10017
MBMA	Metal Building Manufacturer's Association c/o Thomas Associates, Inc. 1300 Sumner Avenue Cleveland, Ohio 44115-2851
MFMA	Maple Flooring Manufacturers Association 60 Revere Drive, Suite 500 Northbrook, Illinois 60062

MIA	Marble Institute of America 30 Eden Alley, Suite 201 Columbus, Ohio 43215
MIMA	Mineral Insulation Manufacturers Association 1420 King Street Alexandria, Virginia 22314
MLSFA	Metal Lath/Steel Framing Association - A Division of NAAMM 8 South Michigan Avenue, Suite 1000 Chicago, Illinois 60603
MS	Military Standardization Documents See General Provisions
MSHA	Mine Safety and Health Administration 4015 Wilson Boulevard, Room 601 Arlington, Virginia 22203
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park Street, NE Vienna, Virginia 22180-4602
NAAMM	The National Association of Architectural Metal Manufacturers 8 South Michigan Avenue, Suite 1000 Chicago, Illinois 60603
NACE	National Association of Corrosion Engineers 1440 South Creek Drive P.O. Box 218340 Houston, Texas 77218-8340
NAIMA	North American Insulation Manufacturers Association 44 Canal Center Plaza, Suite 310 Alexandria, Virginia 22314
NAPA	National Asphalt Pavement Association NAPA Building 5100 Forbes Boulevard Lanham, Maryland 20706-4413
NAPCA	National Association of Pipe Coating Applicators 8th Floor, Commercial National Bank Building 333 Texas Street, Suite 800 Shreveport, Louisiana 71101-3673
NBS	National Bureau of Standards (U.S. Department of Commerce)(See NIST)
NCMA	National Concrete Masonry Association 2302 Horse Pen Road Herndon, Virginia 20171-3499
NEC	National Electrical Code (by NFPA)
NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Suite 1100 Bethesda, Maryland 20814

NELM Northeastern Lumber Manufacturers' Association
272 Tuttle Road
P.O. Box 87A
Cumberland Center, Maine 04021-0687

NEII National Elevator Industry, Inc.
185 Bridge Plaza North, Suite 310
Fort Lee, New Jersey 07024

NEMA National Electrical Manufacturers Association
2101 L Street, NW, Suite 300
Washington, D.C. 20037-1526

NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, Massachusetts 02269-9101

NHLA National Hardwood Lumber Association
P.O. Box 34518
Memphis, Tennessee 38184-0518

NIST National Institute of Standards and Technology
(US Department of Commerce)
Administration Building, Room E128
Gaithersburg, Maryland 20899

Send requests for publications to:
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NHPMA Northern Hardwood and Pine Manufacturers Association, Inc.,
c/o Northern Softwood Lumber Bureau
Box 217
Dear River, Minnesota 56636

NIOSH National Institute for Occupational Safety and Health
NIOSH Building 1, Room 3007
1600 Clifton Road, NE
Atlanta, Georgia 30333

NOFMA National Oak Flooring Manufacturers Association
P.O. Box 3009
Memphis, Tennessee 38173-0009

NPA National Particleboard Association
18928 Premiere Court
Gaithersburg, Maryland 20879-1569

NRCA National Roofing Contractors Association
O'Hare International Center
10255 W. Higgins Road, Suite 600
Rosemont, Illinois 60018-5607

NSF National Sanitary Foundation
3475 Plymouth Road
P.O. Box 130140
Ann Arbor, Michigan 48113-0140

NTMA	The National Terrazzo and Mosaic Association 3166 Des Plaines Avenue, Suite 121 Des Plaines, Illinois 60018
NWWDA	National Wood Window and Door Association 1400 East Touhy Avenue, Suite G-54 Des Plaines, Illinois 60018
OSHA	Occupational Safety and Health Administration U.S. Department of Labor 200 Constitution Avenue, NW Washington, D.C. 20210
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, Illinois 60077-1083
PCI	Precast/Prestressed Concrete Institute 175 W. Jackson Boulevard Chicago, Illinois 60604
PDI	Plumbing and Drainage Institute 45 Briston Drive, Suite 101 South Euston, Massachusetts 02375
PEI	Porcelain Enamel Institute, Inc. 4004 Hillsboro Pike, Suite 224-B Nashville, Tennessee 37215
PI	Perlite Institute, Inc. 88 New Dorp Plaza Staten Island, New York 10306
PS	Product Standard of NBS (U.S. Department of Commerce) Government Printing Office Washington, D.C. 20402
RFCI	Resilient Floor Covering Institute 966 Hungerford Drive, Suite 12-B Rockville, Maryland 20850-1714
RIS	Redwood Inspection Service (Grading Rules) 405 Enfrente Drive, Suite 200 Novato, California 94949
RMMI	Rocky Mountain Masonry Institute 1780 South Bellaire Street, No. 602 Denver, Colorado 80222
SCMA	Southern Cypress Manufacturers Association 400 Penn Center Blvd., Suite 530 Pittsburgh, Pennsylvania 15235
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, Illinois 60021
SDI	Steel Door Institute 30200 Detroit Road Cleveland, Ohio 44145-1967

SFPA	Southern Forest Products Association P.O. Box 52468 New Orleans, Louisiana 70152
SGCC	Safety Glazing Certification Council ETL Testing Labs, Inc., Industrial Park 3933 U.S. Route 11 P.O. Box 2040 Cortland, New York 13045-0950
SIGMA	Sealed Insulating Glass Manufacturers Association 401 N. Michigan Avenue Chicago, Illinois 60611-4267
SJI	Steel Joist Institute 3127 10th Avenue, North Ext. Myrtle Beach, South Carolina 29577-6760
SMACNA	Sheet Metal and Air-Conditioning Contractors' National Association, Inc. 4201 Lafayette Center Drive P.O. Box 221230 Chantilly, Virginia 20151-1209
SPIB	Southern Pine Inspection Bureau (Grading Rules) 4709 Scenic Highway Pensacola, Florida 32504-9094
SSPC	Steel Structures Painting Council 40 24th Street, 6th Floor Pittsburgh, Pennsylvania 15222-4643
SWI	Steel Window Institute c/o Thomas Associates, Inc. 1300 Sumner Avenue Cleveland, Ohio 44115-2851
TCA	Tile Council of America 100 Clemson Research Boulevard Anderson, South Carolina 29625
TIMA	Thermal Insulation Manufacturers Association (See NAIMA)
TPI	Truss Plate Institute 583 D'Onofrio Drive, Suite 200 Madison, Wisconsin 53719
UBC	Uniform Building Code (by ICBO)
UL	Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, Illinois 60062
USDA	U.S. Department of Agriculture Independence Avenue, between 12 th and 14 th Streets, SW Washington, D.C. 20250
WCLB	West Coast Lumber Inspection Bureau (Grading Rules) P.O. Box 23145 Portland, Oregon 97281-3145

WIC Woodwork Institute of California
 P.O. Box 980247
 West Sacramento, California 95798-0247

WMMPA Wood Moulding and Millwork Producers Association
 P.O. Box 25278
 Portland, Oregon 97225-0278

WRI Wire Reinforcement Institute, Inc.
 203 Loudoun Street, SW
 Leesburg, Virginia 20175-2718

WSFI Wood and Synthetic Flooring Institute (See MFMA)

WWPA Western Wood Products Association (Grading Rules)
 Yeon Building
 522 SW 5th Avenue
 Portland, Oregon 97204-2122

WWPA Woven Wire Products Association
 2515 Nordica Avenue
 Chicago, Illinois 60635

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

SECTION 01510

TEMPORARY SERVICES

PART 1 GENERAL

I. DESCRIPTION

- A. The work of this section consists of providing temporary services required for Contractor's performance of the work of this contract.

B. RELATED REQUIREMENTS

- 1. Section 01560 - Temporary Controls.

PART 2 PRODUCTS

I. GENERAL

- A. Temporary materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

II. SANITARY FACILITIES

- A. Sufficiently lighted and ventilated toilet facilities in weatherproof, sight proof, handicap accessible, sturdy enclosures with privacy locks.
- B. Provide separate facilities for men and women.

III. FIRE PROTECTION EQUIPMENT

- A. Extinguisher shall have a minimum UL rating of 2-A:10-B:C.

PART 3 EXECUTION

I. ELECTRICITY AND LIGHTING

- A. There is electrical service available at the project site.
- B. Temporary Electrical: Temporary electrical work shall meet requirements of NFPA 70 (NEC), Article 305.

II. HEATING AND VENTILATING

- A. Provide and maintain adequate temporary heat in work areas without heat, as required for safety and construction requirements, during the progress of the work. Provide ample clearance around stoves and heaters and all chimney and vent connections to prevent ignition of combustible material.

III. TELEPHONE

- A. No telephone service is available on site for Contractor's use.

IV. WATER

- A. Some buildings in optional quote items may be winterized.
- B. Furnish cool, potable water for construction personnel in locations convenient to work stations.

V. SANITARY FACILITIES

- A. Facilities in unoccupied apartments may be used.
- B. Maintain and clean toilet facilities at least weekly.

VI. FIRE PREVENTION AND PROTECTION

- A. Responsible person: A capable and qualified person shall be placed in charge of fire protection. The responsibilities shall include locating and maintaining fire protective equipment and establishing and maintaining safe torch cutting and welding procedures.
- B. Hazard Control: Take all necessary precautions to prevent fire during construction. Provide adequate ventilation during use of volatile or noxious substances.
- C. Spark Arresters:
 - 1. Written determinations of periods and areas of potential fire hazard will be issued by Contracting Officer.
 - 2. Equip all gasoline or diesel powered equipment used during periods of potential fire hazards or in potential forest and grass fire locations with spark arresters approved by the U. S. Forest Service.
- D. Service and Refueling Areas: Fuel all vehicles and mobile equipment off site. Fuel cans stored on site will be in secondary containment tubs.
- E. Smoking: Smoking within buildings or temporary storage sheds is prohibited.
- F. Welding: Cutting by torch or welding shall be performed only when adequate fire protection is provided.

VII. FIRE PROTECTION EQUIPMENT REQUIRED

A. Buildings:

1. Furnish a minimum of one extinguisher for each 1,500 square feet of area or major fraction thereof.
2. Travel distance from any work station to the nearest extinguisher shall not exceed 75 feet.

B. Vehicles and Equipment:

1. Provide one extinguisher on each vehicle or piece of equipment.

END OF SECTION

SECTION 01525

CONSTRUCTION AIDS

PART 1 GENERAL

I. DESCRIPTION

- A. The work of this section consists of furnishing, installing, relocating, maintaining and removing various types of construction aids including platforms and scaffolding.

PART 2 PRODUCTS

- I. GENERAL: Material may be new or used, but shall be suitable for the intended purpose.
- II. BARRIER FENCING: Safety Barrier Fence: Orange plastic fence, minimum height, 4 feet.
- III. PLATFORMS AND STAGING

PART 3 EXECUTION

I. GENERAL

- A. Install platforms as needed for construction activities in each area.
- B. Maintain safety and cleanliness of platform and staging areas to prevent debris from falling into surrounding areas.
- C. Provide necessary barricades, coverings, and protection to prevent damage to existing facilities.
- D. Restore to original grades and conditions, areas adjacent to work areas disturbed or damaged as a result of the work.

II. PROTECTION OF PUBLIC

- A. Barricade, or otherwise block off the immediate work area to prevent unauthorized entry to the work area.
- B. Erect and maintain additional barricades and warning signs in accordance with ANSI D6.1-78 as required by the Contracting Officer.

III. PROTECTION OF EXISTING STRUCTURES

- A. Protect existing facilities to remain in the work areas and on the roads traveled by construction equipment from damage.
- B. Install temporary signs, drums and barricades as needed to keep construction equipment clear of existing structures.
- C. Remove, relocate and install additional devices as needed for changes in type of work and equipment and location of work zones.
- D. Repair any inadvertent damage to structures & utilities resulting from construction operations. If, in the judgment of the Contracting Officer, the damage cannot be repaired, then the Contractor shall replace the damaged sections of the structure with materials matching the existing materials.
- E. Repair of existing facilities to remain that are damaged during construction shall be at no additional expense to the government.

- IV. REMOVAL: Completely remove all temporary construction aids when no longer needed, as approved by Contracting Officer.

END OF SECTION

SECTION 01560

TEMPORARY CONTROLS

PART 1 GENERAL

I. DESCRIPTION

- A. The work of this section consists of providing temporary controls for the maintenance of Park cleanliness and the prevention of contamination of Park lands by construction operations.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION

I. HOUSEKEEPING

- A. Keep project neat, orderly, and in a safe condition at all times.
- B. Provide enough containers for collecting construction debris.
- C. Wet down dry materials and rubbish to prevent blowing dust.
- D. Keep volatile wastes in covered fire and explosion proof containers.
- E. Use or dispose of excavated material as soon as possible after excavation.

II. DISPOSAL

- A. Unless otherwise specified, all removed material becomes the property of the Contractor and shall be disposed of outside the park.
- B. Immediately remove hazardous rubbish from project site. Place other construction debris in refuse containers at least daily. Dispose of refuse at least weekly, in a legal manner, at public or private dumping areas outside the park. Do not burn or bury refuse inside the park.

III. AIR POLLUTION CONTROL

- A. Take all necessary reasonable measures to minimize air pollution by any material or equipment used during construction.

IV. EQUIPMENT FUELING AND SERVICING

- A. All construction equipment that frequently travels the Park roads (such as trucks) and other equipment that can reasonably travel from the work area, shall be fueled and serviced outside the Park limits.
- B. Fuel and service equipment that cannot reasonably travel from the work area to outside the Park at designated sites within, or accessible from, the work zones.
- C. Fuel and service vehicles shall carry tools and materials needed for the clean-up of any

accidental spills. Fuel cans will be stored in secondary containment tubs. Clean up all spills immediately and remove and dispose of contaminated materials outside of the park.

- D. Notify the Contracting Officer of any spillage immediately, regardless of the amount of fuel, oil or other contaminant spilled.
- E. Equipment that is found to be leaking fuel, oil, lubricant, or other contaminant shall be immediately removed from the park.

V. WATER POLLUTION/SEDIMENTATION

- A. Do not dispose of volatile wastes or oils in storm drains or any other location within the park.
- B. Do not allow waste materials to be washed into streams or bodies of water.
- C. Remove all temporary facilities when no longer needed.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

I. DESCRIPTION

- A. The work of this section consists of the general procedures for handling, storing, and protecting material and equipment.

II. TRANSPORTATION AND HANDLING

- A. Arrange deliveries of materials in accordance with construction schedules; coordinate to avoid conflict with work and conditions at the site. Deliver materials in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible. Contractor is encouraged to obtain materials in biodegradable or recyclable/reusable packaging which uses the minimum amount of packaging possible.

III. STORAGE AND PROTECTION

- A. Store materials in accordance with manufacturer's instructions, with seals and labels accessible for inspection.
- B. Interior Storage: Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- C. Exterior Storage:
 - 1. Store products subject to damage by the elements in weathertight enclosures.
 - 2. Store fabricated products above the ground, on blocking or skids; prevent soiling or staining. Cover products subject to damage or deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.
 - 3. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
- D. Protection After Installation: Provide adequate coverings as necessary to protect installed materials from damage resulting from natural elements, traffic, and subsequent construction. Remove when no longer needed.

IV. STORAGE AND PROTECTION OF EQUIPMENT

- A. Store equipment remaining at job site over-night and on weekends in such a way that emergency vehicles can pass. The contractor is responsible for any vandalism that might occur to equipment.

PART 2 PRODUCTS Not used.

PART 3 EXECUTION

I. TRANSPORTATION RESTRICTIONS

- A. The weight of a fully loaded truck used to haul materials shall not exceed 40,000 pounds, or 32,000 pounds per axle, and shall observe all State load restrictions. Maximum speed limits in the Park shall be observed at all times.

END OF SECTION

SECTION 01770

PROJECT CLOSEOUT

PART 1 GENERAL

I. DESCRIPTION

- A. The work of this section consists of final cleanup, closeout submittals, and final inspection procedures.

PART 2 PRODUCTS Not used.

PART 3 EXECUTION

I. CLEANING

- A. Before scheduling the final inspection, remove all tools, equipment, surplus materials, and rubbish. Restore or refinish surfaces that are damaged due to work of this contract to original condition. Remove grease, dirt, stains, foreign materials, and labels from finished surfaces. Thoroughly clean building interiors. Pick up all construction debris from the site. At time of final inspection, project shall be thoroughly clean and ready for use.

II. PROJECT RECORD DRAWINGS

- A. Maintain one complete full-size set of contract drawings and one full-size set of vendor-supplied drawings. Clearly mark changes, deletions, and additions using National Park Service drafting standards to show actual construction conditions. Show additions in red, deletions in green, and special instructions in blue.
- B. Keep record drawings current. Make record drawings available to the Contracting Officer for inspection at the time of monthly progress payment requests. If project record drawings are not current, the Contracting Officer may retain an appropriate amount of the progress payment.
- C. On completion of the total project, submit complete record drawings. Include all shop drawings, sketches, and additional drawings that are to be included in the final set, with clear instructions showing the location of these drawings.

III. CLOSEOUT SUBMITTALS

- A. Submit before final inspection request.
 - 1. Project Record Drawings: As specified above.
 - 2. Guarantees and Bonds: Not used.

3. Spare Parts and Materials: None.
4. Operation and Maintenance Data: Section 01785.
5. Keys: Return all issued keys and locks. Final payment will be withheld until keys are returned or until a contract modification equal to the cost of replacing all like keys and locks is processed.

IV. SUBSTANTIAL COMPLETION AND FINAL INSPECTION

- A. Request a final inspection. Contracting Officer will make an inspection within 10 days of receipt of request.
 1. When work is determined to be substantially complete, Contracting Officer will prepare a list of deficiencies to be corrected before final acceptance and issue a Letter of Substantial Completion. Contractor shall complete the work described on the list of deficiencies within 30 calendar days, as weather permits. If the Contractor fails to complete the work within this time frame, the Contracting Officer may replace, repair, or remedy the work with an appropriate reduction in the contract price.
 2. If work is not determined to be substantially complete, Contracting Officer will notify the Contractor. After completing work, Contractor shall resubmit certification and request a new final inspection.

V. ACCEPTANCE OF THE WORK

- A. After all deficiencies have been corrected, a Letter of Acceptance will be issued, and a Release of Claims will be forwarded to the contractor for signature.

END OF SECTION

SECTION 01785

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of furnishing operation and maintenance data manuals.

1.2 RELATED WORK

- A. Project Record Drawings - Section 01770.

1.3 SCHEDULING

- A. At start of project, begin accumulating operation and maintenance data and initiate an index. Install and index all data in binders within 30 days after delivery of items. As custom written data and test results are produced, add them to the operation and maintenance data file.
- B. Keep operation and maintenance data current. Make operation and maintenance binders available to the Contracting Officer for inspection at the time of monthly progress payment requests. If operation and maintenance binders are not current the Contracting Officer may retain an appropriate amount of the progress payment.
- C. Before scheduling a final inspection, furnish two complete sets of operation and maintenance data to Contracting Officer for review. Should Contracting Officer find manual to be substantially incomplete, the final inspection will be delayed.
- D. Within 30 days following receipt of review comments, deliver four completed sets of Operation and Maintenance data.

PART 2 PRODUCTS

2.1 BINDERS

- A. White, commercial quality, hard back, three-ring, 2-inch maximum ring size, lever-locking type slant ring, with clear window pockets on front and side. Cardinal Slant-D Ring, manufactured by Atapco Office Products Group, St. Louis, Missouri; View SlantRing, manufactured by E-Z-D Premiere View Binder, Torrance, California; or approved equal.

2.2 INDEX SYSTEM

- A. Index sheet with mylar reinforced edges at binder holes and tabbed divider sheets with mylar reinforced edges and pre-printed numbered tabs aligned with numbers and title lines on index sheet. Cardinal One-Step, manufactured by Atapco Office Products Group, St. Louis, Missouri; Avery Ready Index, manufactured by Avery Dennison, Covina, California; or approved equal.

PART 3 EXECUTION

3.1 FORM

JULY 2008

SCHOODIC SHORES APARTMENTS HEAT

01785-1

OPERATION AND MAINTENANCE DATA

- A. Provide four complete sets of data.
- B. Number multiple binder volumes consecutively.
- C. Cover Sheet: Identify the project title, location, park, contract number, prime contractor's name and address, date of substantial completion, and binder volume number. Insert cover sheet into clear plastic view pocket on front of binder. Insert sheet with project title and "Operation and Maintenance" into side clear plastic view pocket.
- D. Index System: Organize data into sections by common subjects and subsystems. Place a consecutively numbered tabbed divider sheet in front of each section. Place index sheet at the beginning of each binder, listing sections by subject name. If multiple binders are used, place a table of contents of all data provided behind the index sheet in each binder.
- E. Data: Fill binders to no more than 75 percent of capacity. Punch holes shall not obscure any data. Normal sheet size shall be 8-1/2 inches by 11 inches. Fold oversize sheets and insert them in 8-1/2 by 11-inch clear pocket sheet protectors placed in binders. When the contents of a single tabbed section covers more than one item, provide colored paper sheets to separate the data for each item.
 - 1. Manufacturers' Data: Provide originals for color or copyrighted data. Black and white data may be originals or clean, good quality reproductions. Where originals are printed on both sides of the page, reproductions shall also be printed on both sides of the page. Copies produced by facsimile transmission and sheets with stamps, such as submittal approval stamps, will not be acceptable. Include only sheets that apply to items installed; cross out inapplicable data.
 - 2. Vendor Furnished As-Built Drawings: Maximum 24-inch by 36-inch sheets with minimum character or lettering size of 1/8 inch. Reduced-size reproductions may be provided instead of full-size drawings if the reproductions are clear and legible. If reduced-size drawings are used, identify as "REDUCED SIZE" and provide graphic scales, if applicable.
 - 3. Custom Written Data: Typewritten text, supplemented by drawings and schematics necessary to describe systems adequately.
 - 4. Equipment Data Sheet: Typewritten data, using form at the end of this section.
 - 5. Schedules: Clean, typewritten schedules reflecting final, as-installed conditions. Hand-written mark-ups of schedules submitted earlier are not acceptable.
 - 6. Data that is poorly reproduced or in any way illegible will be rejected.

3.2 CONTENT

- A. Manufacturers' Published Data: Provide all available data, including installation and operating instructions, parts lists, electrical and mechanical schematics, control circuit documentation, performance data, safety instructions, cleaning and care instructions, and illustrations and instructions for maintenance, including lubrication, disassembly and repair, cleaning, and service. Indicate catalog numbers, sizes, colors, options, and other information pertaining to the products furnished which would be required when ordering replacements. For equipment assemblies, provide data for each separate item of equipment furnished as part of the assembly.

- B. **Equipment Data Sheets:** For each item of equipment included in the operation and maintenance data, provide an Equipment Data Sheet using the form at the end of this section. For equipment consisting of both a driven machine and a driver (for example, a pump and a motor), the equipment data shall cover both the driven machine and the driver. For similar type equipment (for example, multiple exhaust fans of the same model and type), provide a single equipment data sheet with an attached schedule listing the individual equipment items.
- C. **Vendor Furnished As-Built Drawings:** Provide for each electrical and each mechanical control system.
1. For each control system, provide control circuit schematic drawings. Identify each wire and terminal block number. Show terminal numbers on all control devices. Show control wires and devices remote from the control panel.
 2. For each control panel, provide a general arrangement drawing showing location of each control component and terminal block on the panel front and interior. Include a materials list of all panel-mounted control components as well as field-installed control components remote from the panel, identifying components, manufacturer, model number, and initial set points or sensing ranges of devices where applicable.
 3. For packaged equipment systems, provide general arrangement drawings showing interrelationships of the various items of equipment and components.
 4. In addition to the control wiring schematic, provide a power wiring schematic drawing showing the power flow to each motor. Identify each power conductor. Show all overcurrent protection and motor starting devices.
- D. **Schedules:** Provide one copy of material and equipment schedules, as listed in the individual sections, in the appropriate sections of the manual.
- E. **Warranties:** Place a copy of each manufacturer, supplier, and installer warranty extending for a period greater than one year in a single separately identified tabbed section of the manual.
- F. **Test Results:** Include in the operation and maintenance data copies of test results for mechanical and electrical equipment and systems as listed in the individual specification sections.
- G. **Subcontractor and Supplier List:** List all subcontractors and major suppliers who worked on the project. Include each subcontractor's or supplier's address and telephone number and identify work performed.
- .

END OF SECTION

EQUIPMENT DATA SHEET

Equipment Item: _____ Designation: _____

Function: _____

Location: _____

Project: _____

Model No.: _____ Serial No.: _____

Manufacturer Address and Phone:

Supplier Address and Phone:

Preventive Maintenance Tasks:

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Nameplate Data:

Spare Parts Furnished and Other Information:

END OF SECTION

SECTION 02224
SELECTIVE DEMOLITION

PART 1 GENERAL

1.1 DESCRIPTION

- A. Removal of electrical base board heat and electric water heaters in all apartments awarded under this contract. Any incidental to other work as described in contract documents.

1.2 RELATED WORK

- A. NONE

1.3 SUBMITTALS

- A. As specified in Section 01330.

1.4 QUALITY ASSURANCE

- A. Comply with safety requirements for demolition, ANSI A10.6-90.

1.5 PROJECT CONDITIONS

- A. Keep dust and dirt pollution to a minimum.
- B. Ensure safety of persons in demolition area. Provide temporary barricades as required.
- C. Provide adequate fire protection. Keep area clear of hazardous substances and debris.
- E. Separate demolition area from portions of building to remain with temporary dustproof partitions.
- F. Provide temporary weather protection to prevent damage to structure and interior area.

1.6 SCHEDULING

- A. Complete demolition that might damage new construction before starting new work.

PART 2 PRODUCTS NOT USED.

PART 3 EXECUTION

3.1 PREPARATION

- A. Provide temporary supports and protection for portion of structure to remain. Protect fixtures and equipment to remain. Protect nearby structures and furnishings as necessary.
- B. Where necessary cap or disconnect utilities. Provide bypass connections as necessary to maintain utility service to occupied areas of building.

3.2 DEMOLITION

- A. Work systematically from top downward.
- B. Avoid excessive loads on supporting framing by careful location of equipment and prompt removal of demolished materials.

3.3 SALVAGE

- A. Items to be Salvaged: Coordinate with Contracting Officer's Representative.
- B. Items to be Reused: Coordinate with Contracting Officer's Representative.
- C. Carefully clean and store items to be salvaged or reused.

3.4 RESTORATION AND CLEAN-UP

- A. Repair and clean adjacent surfaces damaged or soiled by demolition work.
- B. Restore utility service to normal operation.
- C. Remove equipment, temporary protection and barriers, and debris. Dispose of unsalvageable material.

END OF SECTION

SECTION 02221

UTILITY TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of trenching and backfilling for the construction and installation of pipelines, conduits, and cables. All trenching will be open cut.

1.2 SUBMITTALS

- A. As specified in Section 01330.
- B. Written procedure for trench dewatering and disposal of fluidized materials removed.
- C. Written description of barricading, shoring, cribbing, bracing, and sloping precautions.

1.3 PROJECT CONDITIONS

- A. Arrange construction sequences to provide the shortest practical time that the trenches will be open to avoid hazard to the public, and to minimize the possibility of trench collapse.

1.4 EXCAVATION CLASSIFICATION

- A. Regardless of the nature of material excavated, all excavation will be considered unclassified.

1.5 HAND EXCAVATION

- A. Contracting Officer will direct the performance of hand excavation within the drip line of trees shown on the drawings.

PART 2 PRODUCTS

2.1 GENERAL

- A. All backfill material shall be approved before use and be free of cinders, ashes, ice, frozen soil, large hard clods, organic debris, or other deleterious items. Trench excavation materials may be used as approved.

2.2 BACKFILL MATERIAL

- A. Materials used in backfill, as shown in trench details, are defined as follows:
 - 1. Bedding (BD): When rock, unstable material, or wet trench is encountered at the excavated grade for utility installation, bedding is required. Materials shall be predominantly sand and gravel, having a plasticity index less than 6. Bedding may be omitted if, in the opinion of the Contracting Officer, the excavated trench bottom will adequately support and not damage the utility line.

- a. BD-1: Gradation as follows:

Sieve Size	Percent Passing
No. 4	100
No. 8	55- 85
No. 40	15- 30

2. Select Backfill (SB): Materials shall be predominantly sand and gravel, having a plasticity index less than 6.

- a. SB-1: Gradation as follows:

Sieve Size	Percent Passing
No. 4	100
No. 8	55- 85
No. 40	15- 30

3. Backfill (BF):

- a. BF-1: Materials shall be predominantly sand and gravel, having a plasticity index less than 6, and graded as follows:

Sieve Size	Percent Passing
1-1/2-inch	100
1/2-inch	45- 75
No. 40	10- 25

- B. ASTM D422-63 shall be used for gradation analysis. ASTM D4318-95 shall be used for determination of plasticity index.
- C. Furnish required bedding, select backfill, and backfill materials listed under the appropriate types of utility line in the sections to which this work relates.

2.3 UTILITY LINE MARKING

- A. All utilities shall be marked for location and identified by marking tapes, as specified in Section 02502.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Testing required to determine compliance for the work of this section will be the responsibility of the Contractor, at no additional expense to the Government.

- B. ASTM D698-91 shall be used to determine maximum density and ASTM D1556-90 or ASTM D2922-96 shall be used to determine in-place density.
- C. Testing is waived but may be required at the discretion of the Contracting Officer if improper compaction is suspected.

3.2 TRENCH EXCAVATION

- A. Trenching, General: Excavate the trench to the approximate level of the top of the utility line to be installed, using adequate trench width and side slopes to safely accommodate worker access. Continue excavating for the utility line, to a width not greater than is shown on the appropriate trench detail.
 - 1. Rocky Trench Bottom: Where ledge rock, hard pan, boulders, or sharp-edged materials are encountered, over-excavate a minimum depth of 6 inches below the bottom of the utility exterior wall to permit adequate bedding preparation. The installed utility shall have at least 6 inches of clearance from any rock protrusion. Blasting shall be as specified in Section 02114.
 - 2. Unstable Trench Bottom: Secure approval of depth of over-excavation and stabilization method. For wet trench construction, use approved method of dewatering through diversion, damming and pumping, well points, or underdrain systems. Dispose of removed fluidized materials as approved. Use BD-3 material to build a suitable foundation to within 6 inches of finished utility grade, prior to bedding with the specified material. Compact layers to 95 percent of maximum density in not greater than 6-inch layers. Do not proceed with utility installation until wet trench and unstable conditions are under control.
 - 3. Hand Excavation: Perform hand excavation of trenches dug within the drip line of selected trees as shown. Carefully excavate around all roots 2 inches in diameter and larger to ensure against damage.
- B. Paved Areas: Cut existing pavement full depth to a true line before excavation, as shown, and maintain the edge suitable for repaving. Pavement removed shall not be used as backfill.
- C. Lawn Areas: Where trenches cross established lawn areas, remove turf with approved sod cutting equipment. Store and maintain the removed sod for later replacement. Cut to the lines shown or as directed.

3.3 SHORING AND SHEETING

- A. Construct and maintain all shoring, sheeting, and slope lay-back necessary to protect the excavation, as needed for the safety of the employees and as required by applicable State and Federal laws.
- B. For trenches over 5 feet deep, provide suitable barricades for worker protection. When work area is left open and unattended by Contractor, provide suitable barricades for public safety, regardless of trench depth.
- C. For trenches over 4 feet deep, provide suitable exit means in accordance with applicable provisions of OSHA.
- D. Do not remove timber or sheeting if it is in a compacted zone. Instead, trim it off at a safe level above that zone.
- E. As directed, remove all other sheeting and shoring when safe to do so.

3.4 BACKFILLING

- A. Compaction:
 - 1. Use vibratory compactors for sand and gravel (noncohesive soils).

2. Use mechanical tampers for sand and gravel containing a significant portion of fine-grained material, such as silt and clay (cohesive soils).
 3. Hand tamp around pipe or cable to protect the lines until adequate cushion is attained.
 4. Puddling or water flooding for consolidation of backfill or compaction by wheel rolling with construction equipment will not be permitted.
- B. Bedding: Compact the specified material to 95 percent of maximum density, at a moisture content determined to be suitable for such density. Compaction shall be to the finished utility grade.
- C. Utility Installation: Shape the trench bottom to ensure uniform contact with the full length of the installed line and remove any sharp-edged materials that might damage the line. Compaction shall be maintained beneath the line.
- D. Select Backfill: Fill by hand placement around the utility to just over half depth, and compact in a manner to ensure against lateral or vertical displacement. Place select backfill to 12 inches above the utility line by hand placement in not more than 6-inch layers. Compact each layer to 95 percent of maximum density, at a moisture content determined to be suitable for such density.
- E. Backfill: Place and compact the specified material as follows:
1. Vehicular Traffic Areas: Fill and compact in 8-inch maximum layers to 95 percent of maximum density, at moisture content determined to be suitable for such density.
 2. Pedestrian and Lawn Areas: Fill and compact in 8-inch maximum layers to 90 percent of maximum density, at moisture content determined to be suitable for such density.
 3. Nontraffic Areas: Fill and compact in 8-inch maximum layers to 90 percent of maximum density, at moisture content determined to be suitable for such density.

3.5 SURFACE FINISH WORK

- A. Paved Areas: Replace removed paving and base course with new material of equal or better quality and of the same texture and color as the adjacent paved areas. Saw cut pavement edge to a true line and broom as needed prior to paving.
- B. Lawn Areas: Prepare the area for proper relaying of the previously removed sod. Remove trench and backfill materials from adjacent lawn areas to permit unhindered growth of grasses and safe operation of mowing equipment. Replace sod. Sod and adjacent lawn areas that do not reestablish at the commencement of the next growing season shall be replaced at no additional expense to the Government.
- C. Open and Seeded Areas: Grade all disturbed areas to a finish ordinarily obtained from a blade grader, with no abrupt changes in grade or irregularities that will hold water.
- D. Drainage Ditches: Restore drainage ditches to appropriate line and grade, using approved surface erosion prevention techniques.
- E. Clean-Up: Prior to final inspection and acceptance, remove all rubbish and excess material for disposal as approved, and leave area in a neat, satisfactory condition.

END OF SECTION

SECTION 02502

UTILITY LINE MARKING

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of furnishing and installing utility line marking.

1.2 SUBMITTALS

- A. As specified in Section 01330.
- B. Samples: 24-inch strips of tape and 2 markers.
- C. Certification that the materials used in the tape fabrication meet the requirements of this section.
- D. Installation procedure if the cable is installed by plowing.

PART 2 PRODUCTS

2.1 MARKING TAPE

- A. Capable of being inductively detected electronically.
- B. Construction: Metallic foil laminated between two layers of impervious plastic film not less than 3 inches wide. Total thickness of tape shall not be less than 0.005 inch (5 mil) plus or minus 10 percent manufacturing tolerances.
1. Film: Inert plastic. Each film layer shall be not less than 0.0005 inch thick (0.5 mil).
 2. Foil: Not less than 0.00035 inch thick (0.35 mil).
 3. Adhesive: Compatible with foil and film.
- C. Imprint: 3/4-inch or larger bold black letters.
- D. Legend: Identify buried utility line tape with imprint such as "Caution: Sewer Line Below". Repeat identification at approximately 24-inch intervals.
- E. Background Color: APWA color code and as specified below:

Color	Utility
Safety Red	Electric
High Visibility Safety Yellow	Gas, Oil, Steam, Dangerous Materials
Safety Alert Orange	Telephone, Communications, Cable Television
Safety Precaution Blue	Water System, Irrigation

Color	Utility
Safety Green	Sanitary Sewer, Storm Sewer
Safety Brown	Force Mains, Reclaimed Water, and Effluent Lines

- F. Manufacturer: Lineguard, Inc., Wheaton, Illinois; Reef Industries, Inc., Houston, Texas; Thor Enterprises, Inc., Sun Prairie, Wisconsin; or approved equal.

2.2 SURFACE MARKERS NOT USED

PART 3 EXECUTION

3.1 MARKING TAPE

- A. Install tape in backfill directly over each buried utility line as shown. Place tape by plowing or during final backfilling.
- B. Where utilities are buried in a common trench, identify each line by a separate warning tape. Bury tapes side by side directly over the applicable line.

END OF SECTION

SECTION 15010

GENERAL MECHANICAL PROVISIONS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section contains items of common or administrative nature that pertains to all mechanical work specified in scope of work below.
- B. Contractor is required to provide all labor, equipment, supplies, materials, and miscellaneous items necessary for performing work.
- C. Scope of work:
 - 1. Remove existing resistance electric baseboard heating, thermostats, and electric water heaters as shown in the furnished excerpts from the as-built drawings. Include removal of wiring from the electrical panels capping, concealing and abandoning wiring in compliance with National Electrical Code. Include repairs and touch up paint exposed by removal when not covered by new installation. Bathroom heaters and thermostats, will remain. All piping must be installed to allow convenient and complete draining and winterization. Boiler room installation will allow for emergency cross over to allow one boiler to run all 4 apartments.
 - 2. Furnish and install hot water baseboard with fin tubes as shown. Baseboard enclosures shall be steel factory finished in white or beige to match room finishes. All piping shall be concealed wherever possible. First level floors are concrete slabs on grade. Thermostats will be as detailed in drawings. Each two bedroom apartment will have one zone.
 - 3. Furnish and install, with all necessary appurtenances, supporting water lines and electrical branch circuits, an appropriately sized propane fired condensing, modulating, high efficiency boiler of 92% AFUE or greater, Weil McLain Ultra series or equal. Contractor will install boilers that service two 2 bedroom apartments. Boilers are to be installed in first floor hallway closets and vented to the outside wall in 2 bedroom apartment buildings. Contractor to insulate DHW pipe in all spaces and heating pipe in all unoccupied spaces and the boiler room and furnish and install a carbon monoxide detector in each space occupied by a boiler.
 - 4. Furnish and install, with all necessary appurtenances, an appropriately sized indirect-fired water heater compatible with/matching the selected boiler and locate it in the existing water heater location and run insulated boiler supply and return. Isolating couplings shall be used.
 - 5. The government's propane provider is Dead River Company. Coordinate with the fuel provider to assure a complete and functional fuel system installation. Fuel tank locations are shown on attached drawings. All installation costs passed on by the fuel

provider and any additional installation of the fuel system provided by the contractor shall be included in this contract.

6. All installations shall be governed by applicable portions of the International Code Family and the National Electric Code, except where superseded by a more stringent Maine State code or regulation. All installations shall be consistent with the system manufacturer's design guide and with the accepted proposal and approved submittals which shall be considered as part of the contract requirements.

7. As part of the contract the contractor shall provide the manufacturer's recommended annual service in September 2009, September 2010, and September 2011. The contractor shall maintain the systems for a period of 36 months after acceptance and furnish a 100% parts and labor warranty for the entire system, for the same period. The respective manufacturer's warranty(s) will govern thereafter.

1.2 QUALITY ASSURANCE

- A. All pressure vessels, including safety devices and appurtenances, shall comply with standards of and bear stamp of ASME.

1.3 DRAWINGS

- A. Drawings are diagrammatic and show general design, arrangement, and extent of the existing systems. Do not scale drawings for roughing-in measurement, nor use as shop drawings.
- B. A full set of architectural, structural, electrical and mechanical as-built drawings will be available for inspection at the designated pre-proposal site visit and will be provided to the selected proposer. Make field measurements and prepare shop drawings as needed.

1.4 COORDINATION

- A. Schedule of Work: Coordinate work with other trades. In scheduling, anticipate such items as installing equipment through available openings in structure.
- B. Make minor changes in piping, ductwork, and equipment locations to suit actual conditions.

1.5 PROTECTION

- A. Completely cover motors and other machinery to protect from dirt and water. Cap all openings in pipe and ductwork to protect against entry of foreign matter.

PART 2 PRODUCTS NOT USED.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install equipment in accordance with manufacturer's recommendations unless otherwise specified. Verify final equipment locations with field measurements and with the requirements of the actual equipment to be connected.
- B. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting. Extend grease fittings to an accessible location.
- C. Conceal all piping in finished areas of the building except where shown otherwise.

3.2 EQUIPMENT START-UP

- A. Before start-up, verify that piping, ductwork, and related systems have been tested, and operational and performance tests have been made. Check each piece of equipment for proper lubrication, drive rotation, belt tension, proper control sequence, and other conditions which may cause damage to equipment or endanger personnel.
- B. Ensure control systems are fully operational in automatic mode.
- C. After start-up runs have been completed and systems have been demonstrated to be satisfactory and ready for permanent operation, clean or replace permanent pipeline strainers, clean permanent filters, replace throwaway air filters with new, properly adjust valve and pump packing, adjust belt tensions, secure drive guards in place, and check lubrication and replenish if required.
- D. Provide copies of start-up logs shall to the Contracting Officer and include in Operation and Maintenance Manuals.

END OF SECTION

SECTION 15050

BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section describes materials and methods common to multiple sections of Division 15. Mechanical materials specified under other sections of Division 15 shall meet requirements of this section, unless part of larger factory-assembled equipment.

1.2 COORDINATION OF ELECTRICAL AND MECHANICAL WORK

- A. Electrical Requirements:
 - 1. Provide mechanical system controls, controllers, control transformers, disconnects, starters, control wiring, power wiring, and all other electrical work necessary for complete and operable mechanical systems. Motors, motor circuits, and controllers shall meet requirements of NEC 430-96.
 - 2. Wiring Diagrams: Provide complete and approved wiring diagrams for all electrical power and control work relating to mechanical systems.
 - 3. Install wiring for all mechanical work in conduit.

1.3 SUBMITTALS

- A. As specified in Section 01330.
- B. Submit manufacturer's technical product data and installation instructions.
- C. Current welder AWS certification for welding processes involved and employer signed record accepting responsibility for welder's ability.

1.4 QUALITY ASSURANCE

- A. Mechanical Welding:
 - 1. Perform welding of pressure piping systems in accordance with provisions of ASME Boiler and Pressure Vessel Code, 1995, and ASME B31.9-96, Code for Building Services Piping.
 - 2. Contact the Contracting Officer's Representative 8 hours prior to any welding operations.
- B. Hangers, supports, and components shall be UL listed and FM approved.

PART 2 PRODUCTS

2.1 MOTORS

- A. Motors shall be energy efficient with nominal efficiency equal to or greater than that stated in NEMA MG 1-97, Table 12-6C, for that type and rating of motor. Motors specifically manufactured for a particular piece of equipment with a lower efficiency shall be brought to the attention of the C.O.T.R. for approval.
- B. Motors shall be ball bearing, squirrel cage, open drip proof, normal starting torque of the horsepower and current characteristics scheduled, with thermal overload protection and dustproof and leak proof bearing rings. Insulation shall be rated for continuous duty at 40 degrees C ambient.
- C. Motors shall be dynamically balanced and tested and selected for quiet operation. Motors shall operate continuously at full load with temperature rise in any part not to exceed NEMA standards.
- D. Motors shall have 1.15 service factor at project altitude and at specified voltage.

2.2 DRIVES

- A. V-belt with cast iron sheaves rated not less than 1-1/2 times motor horsepower. Motors 5 horsepower and less for belt-driven equipment shall have adjustable pulleys. Provide two motor sheaves, one of the adjustable pitch type to be used for air balance, and one of the fixed pitch type to be used for final rpm.
- B. Multiple V-belts shall be matched sets.

2.3 DRIVE GUARDS

- A. Meet requirements of OSHA.
- B. All drive guards shall be removable.
- C. Belt Drives: Enclosed in a 16-gauge expanded metal or wire screen drive guard with 70 percent free area, with steel frame covering both sides of belt drive. Provide holes in belt guards for tachometer readings. Provide access door in guard to permit checking of belt tension.

2.4 PIPE HANGERS AND SUPPORTS

- A. General: Provide adjustable pipe hangers on suspended pipe. Chain or perforated strap will not be permitted. Isolate hangers coming in contact with bare copper pipe with dielectric hanger connectors. Hanger rods shall be continuous threaded steel. Turnbuckles shall have capacity of not less than attached rod. Provide bracing to prevent lateral motion.
- B. Individual Hangers:
 - 1. Uninsulated Copper Pipe: Copper plated or coated steel, adjustable swivel ring hanger.
 - 2. Uninsulated Steel and Insulated Steel or Copper Piping and Ducts: Zinc plated adjustable swivel ring hangers for pipe sizes up through 1-1/2-inch, and wrought steel adjustable clevis hangers for pipe sizes 2-inch and over.
- C. Grouped Horizontal Piping and Piping on Walls: Cold formed, lipped channels, not less than 1-1/2-inch by 1-1/2-inch, No. 12 gauge with mounting holes. Hot-dipped galvanized clamps shall be sized for outside diameter of insulation on insulated pipes. Hangers shall support five times the weight or thrust applied without failure.

- D. Vertical Supports: Friction riser clamps, supported and braced.
- E. Piping Run in Metal Studs: One-piece plastic sleeve with integral synthetic rubber pipe insulator.

2.5 SLEEVES

- A. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: ASTM A53-96, Schedule 40, galvanized steel pipe.
- B. Sleeves in Partitions, Walls, Floors and Roofs Other than Masonry or Concrete: Minimum 24 gauge galvanized sheet steel.

2.6 ESCUTCHEONS

- A. One-piece or split-hinge adjustable metal plates with nickel-plated or paintable surface depending on finished surface.
- B. Chrome Plated Pipe: Solid pattern, smooth chrome plated cast brass.
- C. Other Types of Pipe: Heavy solid pattern steel, cast iron, or malleable iron with set screws. Escutcheons installed over sleeves which project above finished floors shall be deep cup type.

PART 3 EXECUTION

3.1 MOTORS

- A. Mount belt driven equipment with motors on common steel base with adjustable motor mount. Align all drives. Use belts identified by the manufacturer and tension belts in accordance with manufacturer recommendations.

3.2 DRIVES

- A. Fan static pressures and rpm shown are approximate. Adjust or change drives as required to achieve air quantities shown.

3.3 ACCESS DOORS

- A. Install access doors for access to concealed valves, dampers, cleanouts, control devices, and equipment requiring service. Coordinate access door location with other trades. Access doors shall carry proper fire rating for surfaces.

3.4 PIPE HANGERS AND SUPPORTS

- A. General: Maintain uniform grading of piping system and install hangers to provide required pipe slopes. Install supports between piping and building structure to prevent swaying and vibration. Install hangers to provide minimum 1/2 inch clear space between finished covering and adjacent work. Do not support weight of piping from mechanical equipment, ductwork, pump flanges, coil connections, and related items. No drilling of structural members will be permitted without approval. Do not bend pipe hanger rods to provide alignment of piping offset from overhead supports. Size hangers on insulated pipe to fit outside diameter of insulation.

- B. Hanger Spacing: Install adjustable type hangers and support the piping systems without sagging. Install hangers at locations not more than 3 feet from the end of each runout and not over 1 foot from each change in direction or offset.
- C. Vertical Supports:
 - 1. Screwed Pipe: Support at 8 feet on center for 1-1/2-inch and smaller pipe. Support at 10 feet on center for 2-inch and larger pipe.
 - 2. Copper Tubing: Support at 6 feet on center for 1-1/2-inch and smaller pipe. Support at 8 feet on center for 2-inch and larger pipe.
- D. Remove rust from ferrous hanger equipment and rods, and apply one coat of rust inhibitive paint before or immediately after erection.
- E. Provide additional support for heavy valves, specialties, and sway bracing where required.

3.5 SLEEVES

- A. Provide sleeves where piping passes through walls, floors, roofs, and partitions. Sleeves shall pass through entire thickness of building material and be secured. Sleeves shall be sized large enough to allow for pipe movement and for continuous insulation. Sleeves shall be installed with 1/2 inch annular space between pipe insulation or bare pipe and the interior of the sleeve. Terminate sleeves flush with walls, partitions, and ceilings. Each sleeve shall be utilized for only one pipe. Firmly pack space between sleeve and pipe with insulation and seal both ends with sealing compound.
- B. Seal annular space with fire barrier UL/FM approved foam where sleeves pass through fire rated assemblies.
- C. Sleeves used below grade and for penetration of waterproofed walls shall contain integral water stop. Pipe sleeves shall be watertight with 25-year siliconized sealant joints on both sides of wall.
- D. In floors containing floor drains, extend floor sleeves 2 inches above finished floor.

3.6 ESCUTCHEONS

- A. Install escutcheons where pipes pass through walls, floors, or ceilings in finished areas. Install nickel-plated escutcheons in finished areas after painting is completed. Paint escutcheons in unfinished areas after painting of surface is completed. Firmly secure escutcheons to uninsulated pipes with set screws.

3.7 SEALANTS

- A. Penetrations in floors, mechanical room walls, and other fire wall construction shall be closed and sealed with firestopping material.
- B. The annular space between exposed pipe or ductwork and walls or floors shall be filled, sealed, and painted to match adjacent surfaces.

3.8 CLEANING

- A. Remove foreign materials including dirt, grease, and splashed paint. Restore damaged finishes of equipment to original condition.

3.9 PRELIMINARY OPERATION

- A. Operate any portion of installation if requested. Such operation does not constitute acceptance of work as complete.

END OF SECTION

SECTION 15075

MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of furnishing and installing markers, tags, and labels for mechanical piping, ducts, and equipment.

1.2 SUBMITTALS

- A. As specified in Section 01330.
- B. Complete list of proposed materials, including manufacturers' names, catalog numbers, and descriptive literature for the following:
 - 1. Plastic pipe markers.
 - 2. Tags.
 - 3. Labels and nameplates.
 - 4. Stencils.
 - 5. Paint.

1.3 CLOSEOUT SUBMITTALS

- A. As specified in Section 01770.
- B. Furnish valve schedule for each piping system, typewritten on 8-1/2-inch x 11-inch bond paper. In tabular format, include valve identification number, piping system, system abbreviation (as shown on tag), location of valve (room or space), function, normal position, and area served. Mark valves which are intended for emergency shut-off and similar special uses by special flags in margin of schedule. Show valve tag designations on as-built drawings.
- C. Furnish project record drawings with valve locations and tag designations shown on floor and elevation plans and schematic diagrams.

PART 2 PRODUCTS

2.1 PLASTIC PIPE MARKERS

- A. Pre-formed, semi-rigid, pre-printed, snap-on, color-coded pipe markers that completely encircle the pipe and are protected by corrosive resistant plastic coating. Directional flow arrows shall be integral with the marker. Snap-on Markers by Seton Name Plate Company, Branford, Connecticut, or approved equal.

2.2 TAGS

- A. Plastic color coded to match piping system identification.

2.3 LABELS AND NAMEPLATES

- A. Black plastic laminate, 1/16-inch thick, with white engraving, drilled for mounting with two sheet metal or brass screws. Pressure-sensitive embossed labels are not acceptable. Engraved SetonPly nameplates style 2060 by Seton Name Plate Company, Branford, CT or approved equal.

2.4 STENCILS

- A. Metal stencils of letter sizes complying with ASME A13.1-96. Exterior grade oil-based alkyd gloss stenciling spray paint. Color shall comply with NEMA Z535.1-91. Manufactured by Seton Name Plate Company, Branford, Connecticut, or approved equal.

2.5 MANUFACTURER'S NAMEPLATES

- 2.6 Metal nameplates permanently fastened to equipment with data engraved or stamped.

PART 3 EXECUTION

3.1 GENERAL

- A. Identify piping and ductwork in crawlspaces, basements, above ceilings, attics, accessible chases, storage, and mechanical rooms. Provide identifying markings at 25 feet on center but not less than once in each room for piping and at 50 feet on center on ductwork. Install identifying devices prior to installation of acoustical ceilings and similar concealment.
- B. Valve numbers and pipe markings shall be identical to those in building 187.

3.2 PIPE MARKERS

- A. Apply pipe and flow direction arrow marking near each valve, control device, and near each branch and riser takeoff excluding takeoffs less than 10 feet in length. Locate markers near locations where pipes pass through walls, floors or ceilings.
- B. Apply marking to pipe so lettering is in most legible position. For overhead piping, apply marking on lower half of the pipe where view is unobstructed, and marking can be read from floor level.

3.3 VALVE IDENTIFICATION

- A. Identify all valves, cocks, and control devices in piping systems, including fire protection valves, in main lines and branches. Exclude check valves, valves within factory fabricated equipment, plumbing fixture supply stops, HVAC terminal devices, and similar rough-in connection of end-use units. List each tagged valve in valve schedule for each piping system.
- B. Valve tags shall have unique prefix to indicate systems, followed by valve number. Example: CW-1; CW-2; HW-1; etc. The prefix shall match the system abbreviation in pipe label color and valve tag lettering schedule.
- C. Valve Schedule: Mount valve schedule in each equipment room. Valve schedule shall be mounted in glazed display frame, screwed to the wall or plastic laminated with grommets and mounted to the wall.

3.4 EQUIPMENT IDENTIFICATION

- A. Manufacturer's Nameplates: Provide on all equipment identifying manufacturer's name, equipment model number, size, capacity, and electrical characteristics. Leave manufacturer's nameplates clean and legible.
- B. Controls: Label magnetic starters and relays to identify connecting or controlled equipment. Label manual operating switches, fused disconnect switches, and thermal overload switches. Label automatic controls, control panels, zone valves, relays, and starters.
- C. Equipment: Label each unit with equipment symbol as noted on equipment schedules on drawings.
- D. Fire Dampers: Identify fire damper access doors. Paint access door red and stencil each door "FIRE DAMPER ACCESS" with 2-inch high letters.

3.5 ADJUSTING AND CLEANING

- A. Relocate any mechanical identification or nameplate which has been visually blocked. Clean face of identification devices and valve charts.

3.6 COLOR AND IDENTIFICATION SCHEDULE

- A. Label piping and valves in accordance ASME A13.1-96 and the following table:

PIPE LABEL COLOR AND VALVE TAG LETTERING SCHEDULE		
SERVICE	FIELD COLOR/ LETTER COLOR	VALVE TAG
Domestic Cold Water	Green/White	CW
Domestic Hot Water	Yellow/Black	HW
Hot Water Recirculating	Yellow/Black	HWC
Chilled Water Supply	Green/White	CHS
Chilled Water Return	Green/White	CHR
Condenser Water Supply	Green/White	C
Condenser Water Return	Green/White	CR
Heating Water Supply	Yellow/Black	HWS
Heating Water Return	Yellow/Black	HWR
Medium Pressure Steam	Yellow/Black	MPS
Low Pressure Steam	Yellow/Black	LPS
Steam Condensate	Yellow/Black	LPR
Liquified Petroleum Gas	Yellow/Black	LPG
Natural Gas	Yellow/Black	GAS
Compressed Air	Blue/White	AIR
Refrigerant Liquid	Yellow/Black	RL
Refrigerant Suction	Yellow/Black	RS

PIPE LABEL COLOR AND VALVE TAG LETTERING SCHEDULE		
SERVICE	FIELD COLOR/ LETTER COLOR	VALVE TAG
Fire Protection Lines	Red/White	FIRE
Storm Drain	Green/White	ST
Sanitary Sewer	Green/White	SAN

END OF SECTION

SECTION 15080

MECHANICAL INSULATION

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of furnishing and installing insulation for mechanical piping, and related equipment.

1.2 QUALITY ASSURANCE

- A. Composite insulation, including jackets, coverings, sealers, mastics, and wet or dry adhesives, shall have a flame-spread rating of 25 or less and smoke-developed rating of 50 or less, as tested by ASTM E84.
- B. PVC fitting covers shall have a maximum flame spread of 25 or less and are excepted from the smoke spread criteria.

1.3 SUBMITTALS

- A. As specified in Section 01330.
- B. Submit manufacturer's technical product data, k-value, thickness, accessories, and installation instructions for the following:
1. Pipe insulation.
 2. Fittings and valve covers.
 3. Equipment insulation.

PART 2 PRODUCTS

2.1 FIBER GLASS PIPE INSULATION

- A. Rigid fiber glass pipe insulation with pressure sensitive tape lap sealing system for installation in temperatures down to 15 degrees F. Pressure sensitive tape shall not separate in high heat or humidity. Factory applied jackets, Type III, Class 12, with maximum water vapor permeance of 0.02 perm. Maximum thermal conductivity (k), 0.23 Btu-in/hr-ft²-°F at 75 degrees F.
- B. Insulation Thickness: Provide insulation of thickness specified for all piping listed in the following table:

PIPE INSULATION THICKNESS				
PIPING APPLICATION	PIPE DIAMETERS			
	1/4" to 1"	1-1/4" to 2"	2-1/2" to 4"	6" to 8"
Domestic Cold, Domestic Hot	1	1	1-1/2	1-1/2
Heating Hot Water	1-1/2	1-1/2	2	3-1/2

- C. Covers: High-impact, UV-resistant, 20-mil thick PVC covering, designed for use outside or to protect insulation from damage. Zeston 2000 PVC jacketing, by Johns Manville Insulations, Denver, CO, or approved equal.
- D. Insulation Coatings and Adhesives: Washable, abrasion-resistant indoor coating/adhesive for lagging thermal insulation. Coating material shall not discolor with age. Foster Sealfas coating 30-36 or Foster Drion 85-75 adhesive, by H. B. Fuller Company, Foster Products Corp., Vadnais Heights, MN, or approved equal.
- E. Insulation Vapor Barrier Mastic: Water based mastic for protection of thermal insulation. Water vapor permeance shall be 3.0 perms at 1/16th dry thickness. Foster SealPas G-P-M 35-00 vapor barrier mastic, by H. B. Fuller Company, Foster Products Corp., Vadnais Heights, MN, or approved equal.

2.2 PIPE FITTING AND VALVE COVERS

- A. Compressed fiber glass blanket insert and premolded 20-mil thick, high-impact, UV-resistant PVC cover; thickness equal to adjoining pipe insulation. Zeston 2000 PVC fitting and valve covers by Johns Manville Insulations, Denver, CO, or approved equal.

2.3 ACCESSORIES

- A. Rigid Insulation Inserts: Molded calcium silicate for installation between pipe and hanger. Compressive strength shall be 200 psi. Thermo-12/Gold rigid insulation inserts by Johns Manville Insulations, Denver, CO, or approved equal.
- B. Galvanized Metal Shields: Shield length and minimum gauge shall be in accordance with the following table:

METAL SHIELD SIZE		
PIPE SIZE	SHIELD LENGTH	THICKNESS
1/4" to 3-1/2"	12"	0.048"
4"	12"	0.060"
5" to 6"	18"	0.060"
8" to 14"	24"	0.075"

2.4 EQUIPMENT INSULATION

- A. Insulation: Closed-cell, flexible, elastomeric thermal type insulation with thermal conductivity equal to or less than 0.27 Btu-in/hr-ft²-degree F at 75 degrees F, Armaflex II sheet and roll insulation, by Armstrong World Industries, Inc., Lancaster, PA, or approved equal.
- B. Adhesive and Sealer: In accordance with manufacturer's recommendations, or Adhesive 520 manufactured by Armstrong World Industries, Inc., Lancaster, PA, or approved equal.
- C. Factory molded fibrous glass with factory applied jackets, Type III, Class 12. Maximum thermal conductivity (k), 0.26 at 75 degrees F mean. Factory molded fibrous glass insulation, by Johns Manville Insulations, Denver, CO, or approved equal. Contractor has option of providing either Micro-Lok 650 AP or 650 AP-T, except that insulation exposed to weather or physical damage shall be metal jacketed, 650 ML.

PART 3 EXECUTION

3.1 GENERAL

- A. Insulate all new heating and hot water piping.
- B. Apply insulation, adhesives, sealants, and mastics as recommended by manufacturer.
- C. Apply insulation on clean, dry surfaces after items to be insulated have been tested and approved.
- D. Penetrations:
 - 1. Exterior Walls: Terminate insulation flush with mechanical sleeve seal for penetrations of below grade walls. Seal terminations with vapor retarder mastic.
 - 2. Interior Walls: Extend piping insulation continuously through walls.
 - 3. Fire Rated Walls: Terminate insulation at penetrations through fire rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with firestopping or fire resistant joint sealer.
 - 4. Floor Penetrations: Extend pipe insulation continuously through floor assembly. For insulation with vapor retarders, seal insulation with vapor retarder mastic where floor supports penetrate vapor retarder.
- E. Apply insulation on all cold surfaces with continuous unbroken vapor seal. Extend sealants to protect all surfaces, ends, and raw edges of insulation especially at valves, fittings, and flanges. Insulate and vapor seal hangers, supports, and anchors that are secured directly to cold surfaces to prevent condensation, extending insulation at least 6 inches from cold surface where possible.
- F. Insulate concealed piping, fittings, valves, and flanges same as exposed work.
- G. Install insulation on components that require periodic inspecting, cleaning, and repairing in a manner that facilitates easy removal and replacement without damage to adjacent insulation.

3.2 FIBER GLASS PIPE INSULATION

- A. Jackets: Install jackets tight. Provide jackets with not less than 1-1/2-inch laps at longitudinal joints and not less than 3 inches wide on butt strips. Secure laps and butt strips with adhesive or vapor barrier mastic. Seal all openings, punctures, and breaks in vapor barrier jackets with vapor barrier mastic.
- B. Pipe Exposed to Weather: Cover insulated pipe, valves, and fittings located outside with weather resistant jacketing installed in accordance with manufacturer's recommendations. Seal all seams and joints.
- C. Pipe Exposed to Abuse or Damage: Cover insulated pipe, valves, and fittings located within 7 feet of finished floor with covering.

3.3 FITTING INSULATION FOR USE ON PIPE FITTINGS

JULY 2008

SCHOODIC SHORES APARTMENTS HEAT

15080-3

MECHANICAL INSULATION

- A. Insulate all fittings, flanges, unions, and valve bodies in cold lines. Coat pipe insulation ends with vapor barrier mastic. Apply premolded, precut insulation. Make joints tight and bond with adhesive.
- B. Encase pipe fitting insulation and valve covers with one-piece premolded 25/50 rated PVC insulated fitting covers. Tuck ends of insulation snugly into throat of fitting and edges adjacent to pipe fitting. Secure PVC fitting cover by stapling and taping ends to adjacent pipe covering. Seal cold water system seam cover edges with vapor barrier adhesive.

END OF SECTION

SECTION 15198

SMALL LP GAS SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of furnishing and installing a liquefied petroleum (LP) gas system, including valves, piping, fittings, meter, regulators, storage tank, and accessories for delivery of propane vapor to appliances within buildings as shown.

1.2 QUALITY ASSURANCE

- A. Work performed under this section shall meet the requirements of all applicable federal, state, local, and LP gas supplier standards and regulations.
- B. Install propane gas piping in accordance with NFPA 58, Uniform Plumbing Code, and Uniform Mechanical Code.
- C. Install propane gas piping in accordance with NFPA 58, International Plumbing Code, and International Mechanical Code.
- D. Install propane gas piping in accordance with NFPA 58 and BOCA National Mechanical Code.
- E. LP gas system installer shall be regularly engaged in the design and installation of LP gas systems, have experience with LP gas projects similar in size to this project, and shall employ personnel experienced and skilled in the LP gas trade.
- F. Personnel responsible for making heat fusion bonded joints in plastic piping shall be certified in accordance with CFR Title 49, Part 192, Section 192.285. Additionally, personnel shall be trained by the electrofusion equipment manufacturer or by the manufacturer's authorized representatives.
- G. Installer shall be licensed to install LP gas systems in the state in which the work is performed.

1.3 SUBMITTALS

- A. As specified in Section 01330.
- B. Manufacturer's product data, including equipment capacity and pressure ratings, for the following:
 - 1. Valves.
 - 2. Piping.
 - 3. Meter.
 - 4. Regulator.

5. Storage tank.
6. Tank appurtenances.
7. Gauges.

C. Operator's heat fusion certification.

D. Copy of installer's state LP gas license.

1.4 CLOSEOUT SUBMITTALS

A. As specified in Section 01770.

B. Operation and maintenance data as required by Section 01785.

1. Submit operation and maintenance data for the following:
 - a. Valves.
 - b. Meter.
 - c. Regulators.
 - d. Storage tank.
 - e. Tank appurtenances.

C. Test reports.

PART 2 PRODUCTS

2.1 GENERAL

A. All system components shall be suitable for LP gas service, and have a rated working pressure as required by NFPA 58.

2.2 PIPING

A. Steel Pipe: ASTM A53, Type E or S, Schedule 40, black steel pipe.

1. Fittings, 2-Inch and Smaller: ASME B16.3, Class 150, malleable iron, standard pattern, with threads conforming to ASME B1.20.1.
2. Unions: ASME B16.39, Class 150, black malleable iron; female pattern; brass-to-iron seat; ground joint.
3. Dielectric Unions: Forged steel, ground joint, with high impact nylon insulators, threaded ends, 3,000 psi working pressure.

4. Cast iron fittings are not allowed.
- B. Copper Pipe: ASTM B42 copper pipe, ASTM B88 copper tubing type K or L, or ASTM B280 copper tubing .
 1. Fittings: Screwed, brazed, or flared.
 2. Brazing Filler: Material shall have a melting point exceeding 1,000 degrees F.
- C. Plastic Pipe: ASTM D2513, PE 2406, medium density polyethylene pipe, integrally colored yellow, with minimum SDR of 11.
 1. Fittings: ASTM D2683 socket fusion fittings.

2.3 COATING FOR UNDERGROUND STEEL PIPE AND FITTINGS

- A. The coating may be one of the following:
 1. Fusion Bonded Epoxy: NAPCA 12-78-94 (polyethylene or polypropylene).
 2. Extruded Polyolefin: NAPCA 14-83-94.
 3. Tape Coating: NAPCA 15-83-94.

2.4 CATHODIC PROTECTION

- A. Anodes: Cast magnesium alloy, galvanized steel core rod, and 10 feet of No. 12 AWG solid TW insulated lead wire. Harco Certified Magnesium Anodes by Harco Technologies, Corpro Co., Inc., Medina, OH, or approved equal.
- B. Test Stations: Test station to test pipeline to soil potentials for determining cathodic protection system performance. Handley Industries, Inc., Jackson, MI, or approved equal.

2.5 VALVES

- A. Appliance Shutoff Valves: ANSI Z21.15, bronze ball valve, lever handle, chrome plated ball, with minimum pressure rating of 5 psig. Series GB-10, by Conbraco Industries, Inc., Matthews, NC, or approved equal.
- B. Manual Building Shutoff Valve: UL listed, ball valve, 600-psig WOG, 250-psig LP gas, two-piece bronze body, conventional port, bronze trim, chrome plated ball, reinforced TFE seats and stem seal, adjustable gland packing, blowout-proof stem, threaded ends. Type II, Composition BZ, Style 3. LP gas Apollo 80-100 Series, by Conbraco Industries, Inc., Matthews, NC, or approved equal.
- C. Earthquake Actuated Automatic Gas Shutoff Valve: UL listed, ANSI Z21.70, 20 psig rated shutoff valve with mechanical trigger mechanism to stop gas flow within 5 seconds when subjected to seismic activity of sufficient magnitude to cause piping or appliance damage. Series

310 or 315, as manufactured by Pacific Seismic Products, Lancaster, CA; model Twingate, as manufactured by Quake Defense, Burlingame, CA; or approved equal.

2.6 PIPING SPECIALTIES

- A. Flexible Connector: NFPA 58, corrugated stainless steel inner hose, stainless steel cover, 350 psig working pressure. Approved for LP gas service.
- B. Transition Riser: Anodeless type with polyethylene carrier pipe, fusion-bonded epoxy coated steel jacket pipe, threaded aboveground end. Sized to match connecting piping. Horizontal and vertical leg dimensions to meet depth-of-cover requirements. ASR by Uponor Aldyl Co., Shawnee, OK, or approved equal.
- C. Strainer: Wye pattern, full line size, threaded ends, designed for LP gas service, 600 psig working pressure. Removable 80 mesh stainless steel screen and access flange with O-ring gasket. Type W, as manufactured by Smith Precision Products Company, Newbury Park, CA, or approved equal.

2.7 GAS METER

- A. AGA B109, aluminum case, positive displacement, diaphragm type, suitable for LP gas vapor, with temperature compensation and corrosion-resistant components. 20 psig minimum working pressure. Capacity shall not be less than connected building load.
- B. Meter Support: Malleable iron meter bar support frame with meter offset swivel pipes, meter nuts, O-ring seals, dielectric unions, and threaded ends. Meter offset swivel pipes may be omitted when meter bar dimensions match gas meter connections.

2.8 REGULATOR

- A. UL 144, two-stage regulator with internal pressure relief valve, rainproof vent, and capable of reducing inlet pressure of 10 psig to outlet pressure of 11 inches WC. Regulator shall be equal to or greater than the connected building load.

2.9 STORAGE TANK ASSEMBLY

- A. UL 644 and ASME Boiler and Pressure Vessel Code storage tank assembly designed for minimum pressure of 250 psig. Trinity Industries, Inc., Dallas, TX, or approved equal.
- B. Storage Tank:
 - 1. Horizontal steel type, as provided by LP provider.
 - 2. All necessary welds shall be performed at the factory. No field welding will be permitted on the tank.
 - 3. Furnish tank complete with lifting lugs and electrical grounding lug. Provide flanged many and seismic restraint flanges where shown or required.

4. Aboveground Tank:

- a. Factory grit-blasted and painted with one coat of primer and one or more final coats of manufacturer's standard white finish.
- b. Steel supports for mounting on a flat reinforced concrete pad as shown. Supports shall be designed to prevent distortion. Anchor bolt holes in support feet shall be slotted or oversized to allow for thermal expansion and contraction as required.

C. Storage Tank Appurtenances: Fabricate appurtenances of materials resistant to the action of LP gas, and suitable for LP gas service. Cast iron fittings and appurtenances are not allowed.

1. Pressure Relief Valve: UL listed, tamper resistant, direct spring-loaded, set to relieve vapor at the design pressure of the tank, with sufficient rated capacity to meet the requirements of NFPA 58. Attach valve directly to the tank opening. Permanently mark the start-to-leak pressure, relieving capacity, and manufacturer's name and catalog number on the valve.
2. Manual shutoff valve for vapor service.
3. Liquid Withdrawal Excess-flow Check Valve: Designed to close automatically at rated flows of vapor or liquid specified by the manufacturer. To allow equalization of pressure, excess-flow valves shall be designed with a bypass opening sized in accordance with NFPA 58.
4. Fixed liquid level gauge with permanent markings adjacent to the gauge or on tank nameplate shall show percentage of fill.
5. Float gauge.
6. Double backflow check filler valve.

2.10 UTILITY TRENCHING AND BACKFILLING

- A. As specified in Section 02320.

2.11 UTILITY LINE MARKING

- A. As specified in Section 02502.

2.12 TRACER WIRE

- A. Minimum No. 12 AWG copper wire.

2.13 BOLLARDS

- A. Not used.

PART 3 EXECUTION

3.1 GENERAL

- A. Install LP gas system in conformance with manufacturer's installation instructions, NFPA 54, NFPA 58, and the installation and service guidebooks prepared by the National Propane Gas Association (NPGA).

3.2 PIPE INSTALLATION - GENERAL

- A. Clean all pipe before installation. Remove all internal debris and scale. Keep openings in pipe closed during construction to prevent entrance of debris.
- B. Ream all pipe ends after cutting.
- C. Cut pipe threads in accordance with ASME B1.20.1. Apply noncorrosive, nonhardening pipe thread compound to male threads only. Pipe thread compound shall be an approved type, resistant to the solvent action of LP gas.
- D. Where pipe connections are made with dissimilar metals or to isolate underground cathodically protected piping from the remainder of the system, install a dielectric union or flange with one ferrous end connection and one brass or bronze end connection, separated by insulating material.
- E. Electrically ground gas piping system inside the building in accordance with NFPA 54. Do not use gas piping as grounding electrode.
- F. Install gas piping at a uniform slope of 1/4 inch in 15 feet to prevent traps. Horizontal lines shall slope upward to risers and from the risers to the equipment or the meter (or service regulator where a meter is not provided).

3.3 UNDERGROUND PIPE INSTALLATION

- A. Underground piping shall be buried not less than 24 inches below finished grade.
- B. Install gas line inside a sleeve where the line is exposed to vehicle loads or other possible damage. At road crossings, the sleeve shall be Schedule 40 steel pipe with welded air-tight joints and vent risers. Terminate vent risers with 180-degree bends fitted with corrosion resistant insect screen. Prepare and paint outside of sleeve with coal tar epoxy-polyamide paint.
- C. Utility Trenching and Backfilling: As specified in Section 02320.
- D. Identification: As specified in Section 02502.
- E. Underground Plastic Gas Pipe:
 - 1. Install underground plastic gas distribution piping according to ASTM D2774. Join pipe and fittings by heat fusion, in accordance with the manufacturer's recommendations.

2. Install copper tracer wire attached to underground plastic pipe. Attach with plastic tie-wraps or other approved method. Interconnect tracer wires by soldering together meet at each piping intersection and terminate at each pipe end. Bring end of tracer wire above ground at each riser.

F. Underground Coated Steel Pipe:

1. Cover all fittings and welds of underground coated steel pipe in accordance with NAPCA 6-69-94-5 for heat-shrink polyethylene pipe sleeves or NAPCA 6-69-94-3 for priming and wrapping with hot-applied coal tar tape.
2. Cathodic Protection: Provide magnesium anodes in numbers and sizes as necessary to protect coated underground piping based upon actual soil resistivity at the site. Attach anode wires to piping with thermit welds. Coat weld sites with coal tar mastic after welding.

3.4 ABOVE GROUND PIPE INSTALLATION

- A. Use steel piping for above ground installations.
- B. Install pipe in safe locations. Bring gas service above ground before entering the building. Below grade service entrances are considered a safety hazard and will not be permitted. Install all LP gas piping within the building in exposed locations only. Do not conceal LP gas piping within walls or other areas where leaking gas could accumulate without being detected. Do not install gas piping in or through stairwells, ducts, trash chutes, chimneys, flues, dumbwaiters, or elevator shafts.
- C. At each appliance, install a union, scale trap, flexible connector, and shut-off valve. Route supply piping to allow room for service and maintenance.
- D. Hanger and Support Installation: As specified in Section 15050.
- E. Install insulating type fittings to protect the gas meter and building piping from corrosion when connecting to underground metallic gas mains.
- F. Connect branch piping at top or side of horizontal piping.
- G. Identification: As specified in Section 15075.

3.5 REGULATORS

- A. Install regulators with drip lip pointing down, or provide weather protection to prevent regulator freeze-ups. Support regulators with bracing as required for a secure installation. Verify regulator pressure settings to ensure proper system operation and to prevent overpressurizing the gas controls within the appliances.

3.6 ABOVEGROUND STORAGE TANK INSTALLATION

- A. Install tank level, on concrete foundation as shown. Ensure that tank supports will accommodate thermal expansion and contraction. Install electrical ground wire. Remove damaged tanks and replace with new undamaged tanks, at no additional cost to the Government. No field welding will be permitted on the tank. Install bollards around tank as shown or as required to protect tank from accidental vehicle damage.

3.7 INITIAL TANK FILL

- A. Purge all air from tank before filling. Coordinate with government's LP provider to provide initial fill of LP gas tank for system testing. At job completion, fill tank(s) to rated capacity.

3.8 PAINTING

- A. Paint all exterior exposed aboveground gas piping.

3.9 FIELD QUALITY CONTROL

- A. Inspect, test, and purge gas system in accordance with NFPA 54 and NFPA 58. Test with air or inert gas only.
- B. Test at a pressure of 50 psi for a period of not less than 1 hour without showing any drop in pressure.
- C. Check connections with a leak test solution which is listed for this purpose. Do not use soap solution or solutions containing ammonia which may corrode the pipe.
- D. Repair leaks and defects with new materials. Makeshift remedies will not be permitted. Retest system until satisfactory results are obtained.
- E. Submit written test report to the Contracting Officer.
- F. Verify capacities and pressure ratings of gas meters, regulators, valves, and specialties.
- G. After pressure testing has been completed, fully purge all air from gas piping. Do not purge open end of piping systems into confined spaces or areas where there are sources of ignition, unless the space is adequately ventilated, purging rate is controlled, and all hazardous conditions are eliminated.

3.10 TRAINING

- A. As specified in Section 15500.
- B. Provide up to one hour of operating and maintenance instruction to Government personnel.

END OF SECTION

SECTION 15400
PLUMBING SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of furnishing and installing waste, vent, and sanitary sewer system; storm drains; and domestic cold and hot water supply systems.

1.2 RELATED WORK

- A. Mechanical insulation - Section 15080.

1.3 SUBMITTALS

- A. As specified in Section 01330.
- B. Submit manufacturer's data for the following:
 - 1. Pipe.
 - 2. Fittings.
 - 3. Joining material.
 - 4. Valves.
 - 5. Backflow preventers.
 - 6. Water heater.

1.4 QUALITY ASSURANCE

- A. Meet requirements of International Plumbing Code and ASME B31.9.

1.5 CLOSEOUT SUBMITTALS

- A. As specified in Section 01770.
- B. Operation and maintenance data for review and approval as required by Section 01785.
 - 1. Furnish manufacturer's operation and maintenance data for the following:
 - a. Valves.
 - b. Backflow preventers.
 - c. Water pressure reducing valve.
 - d. Shock absorbers.

- e. Water heater.
- C. Valve schedule for all plumbing valves. For each valve, list valve designation number, valve type, size, location, and function.
- D. Backflow preventer state certification test.

PART 2 PRODUCTS

2.1 DOMESTIC WATER PIPING AND FITTINGS, ABOVEGROUND

- A. Copper Pipe: ASTM B88, copper tubing, hard drawn, Type L.
 - 1. Fittings: ASTM B16.18, cast copper alloy, or ASTM B16.22, wrought copper.
 - 2. Joining Material: ASTM B32, Alloy SN95, or SN94 lead free solder.

2.2 VALVES

- A. Gate Valves:
 - 1. 2-inch and Smaller: Class 150, 300 psi, ASTM B62 cast-bronze body and union bonnet, solid bronze wedge, rising stem, integral seat, threaded or soldered ends, and aluminum or malleable-iron handwheel.
- B. Ball Valves, 4-inch and Smaller: Class 150, 600 psi, ASTM B584 bronze body and bonnet, two-piece construction, chrome-plated brass ball, conventional port, bronze or brass stem; Teflon seats and seals; threaded or soldered end connections, vinyl-covered steel lever handle and handle memory stop.
- C. Globe Valves:
 - 1. 2-1/2 Inches and Smaller: Class 150, 300 psi, ASTM B62 cast-bronze body and screwed bonnet, rubber, bronze, or Teflon disc, silicon bronze-alloy stem, Teflon-impregnated packing with bronze nut, threaded or soldered end connections, and aluminum or malleable-iron handwheel.
- D. Check Valves:
 - 1. Swing Check Valve, 2-1/2 Inches and Smaller; Class 150, 300 psi CWP, ASTM B62, cast-bronze body and cap, horizontal swing, regrinding type, Y-pattern, renewable bronze disk, threaded or soldered end connection.

2.3 BACKFLOW PREVENTERS

- A. Vacuum Breaker: ASSE 1012, suitable for continuous pressure. Include inlet screen and intermediate atmospheric vent.
- B. Check Valve: As required by code.
- C. Reduced Pressure: ASSE 1013, reduced pressure type backflow preventer suitable for continuous pressure applications. Include outside screw and yoke gate valves or ball valves on inlet and outlet, and strainer on inlet, test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves.

2.4 PRESSURE REDUCING VALVE

- A. ASSE 1003, water regulator, rated for initial working pressure of 150 psig minimum, bronze body with threaded ends, integral factory-installed Y-pattern strainer, with adjustable reduced pressure range.

2.5 DOMESTIC WATER ACCESSORIES

- A. Unions: ASME B16.22, wrought copper solder joint, ground seat.
- B. Flanges: Class 125, cast iron or cast bronze flanges.
 - 1. Bolts and Nuts: ASME B18.2.1, carbon steel square head machine bolts with galvanized heavy hex nuts.
 - 2. Gaskets: ASME B16.21, nonmetallic, flat, 1/16-inch, full faced, for potable water service.
- C. Dielectric Connections: Fitting having insulating material isolating joined dissimilar metals. Epcos Sales, Inc., Cleveland, OH, or approved equal.
 - 1. Unions: Rated for 250 psig minimum working pressure at 180 degrees F. temperature.
 - 2. Flanges: 150 psig minimum working pressure, with bolt insulators, dielectric gasket, bolts, and nuts.

2.6 SHOCK ABSORBERS

- A. ASSE 1010, bellows or piston type with pressurized cushioning chamber. Absorbotron, by Josam Manufacturing Company, Michigan City, IN, or approved equal.

2.7 PIPE SLEEVES

- A. As specified in Section 15050.

2.8 ESCUTCHEONS

- A. As specified in Section 15050.

2.9 HANGERS, ANCHORS, AND GUIDES

- A. As specified in Section 15050.

2.10 IDENTIFICATION

- A. As specified in Section 15075.

2.11 INSULATION

- A. As specified in Section 15080.

2.12 WATER HEATER

- A. Indirect Fired Type:

1. Description: 41 gallon. Meets ASHRAE 90.1 standard for energy conservation. AMTROL TD-7DW.
2. Insulation: Glass fiber or polyurethane foam surrounding entire tank, 2"CFC free less than ½ degree/hr. standby loss.
3. Temperature Control: Adjustable thermostat for each element.
4. Drain Valve: ASSE 1005, factory installed.
5. Combination Temperature and Pressure Relief Valve: ASME rated and stamped.
6. Warranty: 15 year warranty on tank.

PART 3 EXECUTION

3.1 GENERAL

- A. Install materials and equipment as shown and specified in accordance with governing codes and standards.
- B. Rough in work as construction progresses to minimize cutting, eliminating interferences.
- C. Locate equipment requiring service and maintenance in fully accessible positions.
- D. Runs and arrangement of piping shall be as shown in the drawings, subject only to such changes and modifications as may be necessary to suit actual conditions at building, to avoid interference or conflict with work of other trades. Install piping concealed in floor or in wall construction or excavations to prevent delay to other work and to allow ample time for necessary tests and approvals.
- E. Carefully check installations against structural, architectural, and mechanical drawings and note where walls, ceilings, beams, and pipe shafts are furred or enclosed. Piping shall not be furred in or covered before approval by the Contracting Officer.
- F. Support horizontal piping runs from ceilings or construction above. Locate as closely as possible to structural members or bottom of slabs or beams to obtain maximum head room. If piping interferes with finished ceiling or wall surfaces, notify Contracting Officer and correct unsatisfactory conditions.
- G. Waste, soil, water, and other services shall be fully connected to each individual piece of apparatus with required piping, unions, flanges, valves, check valves, and other needed appurtenances.
- H. Each branch pipe shall be controlled by valve where it connects to supply main or riser. Each toilet room, group of fixtures, or isolated fixture shall be separately controlled by valves in accessible location and provided with access doors where necessary.
- I. Install swing joints or expansion loops to allow for pipe expansion. Securely anchor pipes so expansion can occur at these joints.
- J. Make joints between dissimilar piping by dielectric unions or flanges.

- K. Use reducing fittings wherever a change in pipe size occurs. The use of bushings will not be permitted.
- L. Provide piping with unions to permit alterations and repairs.
- M. Exposed piping at plumbing fixtures shall be chrome-plated brass pipe.

3.2 VALVES

- A. Where soldered end connections are used, use solder having a melting point below 840 degrees F for gate, globe, and check valves; below 421 degrees F for ball valves.
- B. Provide extended stems where insulation is specified.
- C. Valves shall be same size as upstream piping, unless otherwise shown.
- D. Drain valves shall be 1/2-inch globe type valves with capped male hose nipples. Install low point drains in cold and hot water systems.

3.3 INSTALLATION OF WATER SYSTEM

- A. Install piping with 0.25 percent slope toward drain.
- B. Conceal water piping in finished areas.
- C. Cold Water: Locate underground service minimum of 4 feet below grade. Fit pipe connections to mechanical equipment with unions for ease of dismantling.
- D. Hot Water: Begin installation of hot water piping system at water heater and traverse building. Fit piping around heater and equipment with sufficient number of unions to ensure easy dismantling for maintenance.

3.4 BACKFLOW PREVENTERS

- A. Route pipe from relief outlet to nearest floor drain.

3.5 SHOCK ABSORBERS

- A. Sizes based on water-supply fixture units as shown. Install ball valve between shock absorber and water line for servicing.

3.6 HANGERS, ANCHORS, GUIDES

- A. As specified in Section 15050.

3.7 PIPE IDENTIFICATION

- A. As specified in Section 15075.

3.8 INSULATION

- A. As specified in Section 15080.

3.9 WATER HEATERS

- A. Install units plumb, level, and firmly anchored.
- B. Set and connect units according to manufacturer's written instructions. Maintain manufacturer's recommended clearances.
- C. Connect hot and cold water piping to water heaters with shutoff valves and dielectric unions.

3.10 FLUSHING AND CLEANING

- A. Flush and clean sanitary lines and remove water and debris before final connection into existing waste lines.

3.11 DISINFECTION OF WATER SYSTEM

- A. Disinfect all water piping and equipment upon completion of piping installation. Following disinfection, flush water from system through its extremities. Continue flushing until samples show quality is comparable with public water supply and complies with requirements of public health authority having jurisdiction.

3.12 FIELD QUALITY CONTROL

- A. Notify Contracting Officer at least 48 hours before testing. Perform tests in presence of Contracting Officer.
- B. Rough-In Inspection: Piping shall be inspected before concealing or closing-in after rough-in and before setting fixtures.
- C. Final Inspection:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
 - 2. Submit test report for each test.
 - 3. Test drain, waste, and vent piping on completion of rough-in. Close openings in piping system and fill with water to point of overflow but not less than 10 feet of head. Water level must not drop from 15 minutes before inspection starts through completion of inspection. Correct leaks and retest system.
 - 4. Cap domestic water piping and subject piping to static water pressure of 50 psig above operating pressures or 150 psig maximum without exceeding pressure rating of piping system materials. Allow to stand for 4 hours. Correct leaks and loss in pressure and retest system.

END OF SECTION

SECTION 15500
HYDRONIC SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of furnishing and installing piping systems associated with heating water systems complete with all appurtenances.

1.2 RELATED WORK

- A. Mechanical insulation - Section 15080.
- B. Boilers - Section 15510.

1.3 QUALITY ASSURANCE

- A. Comply with ASME B31.9 for materials, products, and installation.
- B. Qualify welding process and operators as specified in Section 15050.

1.4 SUBMITTALS

- A. As specified in Section 01330.
- B. Submit manufacturer's product data for the following.
 - 1. Pipe.
 - 2. Strainers.
 - 3. Balancing valves.
 - 4. Pressure gauges.
 - 5. Thermometers.
 - 6. Air separators.
 - 7. Expansion tanks.
 - 8. Flexible connectors.
 - 9. Valves. Include body material, valve design pressure and temperature classification and dimensions.

PART 2 PRODUCTS

2.1 PIPING AND FITTINGS

- A. General: Galvanized pipe or fittings shall not be used.

- B. Working pressure and temperature maximums, 125 psi and 250 degrees F; water service.
- C. Copper Pipe: ASTM B88, copper tubing, hard drawn, Type K for underground lines and Type L for above ground lines.
 - 1. Fittings: ASME B16.22, wrought copper solder joint.
 - 2. Joining Material:
 - a. Solder: ASTM B32, 95-5 tin-antimony solder for above ground lines.
 - b. Brazing: AWS A5.8, Classification BAg 1 (silver) for underground lines and where copper pipe is connected to brass.
 - 3. Unions: ASME B16.22. Wrought copper solder joint, ground seat.
 - 4. Flanges: Class 125, cast iron or cast bronze flanges.
 - a. Bolts and Nuts: ASME B18.2.1.
 - b. Gaskets: ASME B16.21, nonmetallic, flat, 1/16-inch, full faced, for water service.
 - 5. Dielectric Connections: Fittings having insulating material isolating joined dissimilar metals.
 - a. Unions: 175 psi minimum working pressure, ends to match connections.
 - b. Flanges: Class 125, cast bronze, ASME Standard, with bolt insulators, dielectric gasket, bolts, and nuts.
- D. Steel Pipe: ASTM A53, Schedule 40, seamless black steel pipe.
 - 1. Fittings:
 - a. Threaded: ASME B16.4, Class 125, cast iron, or ASME B16.3, Class 150, malleable-iron. Standard pattern for threaded joints. Threads shall conform to ASME B1.20.1.
 - b. Flanged: ASME B16.1, Class 125, cast iron, raised ground face, bolt holes spot faced.
 - c. Welded: ASTM A234, standard weight, butt weld, black iron.
 - d. Grooved Couplings and Mechanical Fittings: ASTM A536 ductile or ASTM A47 malleable iron, with enamel finish and grooves or shoulders designed to accept grooved couplings. Synthetic-rubber gasket, with central-cavity, pressure-responsive design, and ASTM A183 carbon-steel bolts and nuts.
 - 2. Unions: ASME B16.39, malleable-iron, Class 150, hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.
 - 3. Dielectric Unions: Threaded or soldered end connections for the pipe materials in which installed. Constructed to isolate dissimilar metals, prevent galvanic action, and prevent corrosion.

2.2 VALVES

A. Gate Valves:

1. 2-inch and Smaller: Class 150, 300 psi, ASTM B62, cast bronze body and union bonnet, solid bronze wedge, rising stem, integral seat, soldered or threaded ends, and aluminum or malleable iron hand wheel.
2. 2-1/2-inch and Larger: Class 125, 200 psi, ASTM A126, cast iron body and bonnet, solid cast iron wedge, brass-alloy stem, outside screw and yoke, flanged end connections and cast iron hand wheel.

B. Ball Valves, 4-inch and Smaller: Class 150, 600-psi, ASTM B584, bronze body and bonnet, two-piece construction, chrome-plated brass ball, conventional port, bronze or brass stem, Teflon seats and seals, soldered or threaded end connections, vinyl-covered steel handle, and handle memory stop.

C. Check Valves:

1. Swing Check Valve:

- a. 2-1/2-Inch and Smaller: Class 150, 300 psi CWP, ASTM B62, cast-bronze body and cap, horizontal swing, regrinding type, Y pattern, renewable bronze disk. Threaded or soldered end connection.
- b. 3-Inch and Larger: Class 125, 200 psi CWP, ASTM A126, cast iron body and bolted cap, horizontal swing, bronze disc, flanged or grooved end connections. Renewable bronze seat and disk capable of being refitted while the valve remains in line.

D. Balancing Valves: 125 psig working pressure, 250 degrees F maximum operating temperature, bronze body balance valves with connections for portable differential pressure meter. Meter connections with integral check valves and seals, integral pointer and calibrated scale to register degree of valve opening. Valves 3/4 inch and smaller shall have solder connections except for heating water systems, valves 1 inch to 2 inches shall have threaded connections, and valves 2-1/2 inches and larger shall have flanged connections.

E. Safety Relief Valves: Brass or bronze body with brass and rubber, wetted, internal working parts. Valves designed, built, rated, and stamped in accordance with ASME. Safety relief valves shall be preset for 30 psi, non-adjustable, 3/4-inch inlet with 550,000 Btuh rating. Model 38B by Amtrol, West Warwick, RI, or approved equal.

F. Automatic Fill Valve: Diaphragm operated, cast brass body, fill valve designed to maintain water pressure in a closed water system. Valve shall include cleanable strainer, removable seat assembly, and built-in check valve. Valve shall have factory setting of 12 psig with field adjustment range of 10 to 25 psig. Maximum operating temperature shall be 225 degrees F, maximum working pressure of 125 psig. Valve shall have 3/4-inch inlet and outlet. Model B7-12 by ITT Bell and Gossett, Morton Grove, IL; Model 11F by Amtrol, West Warwick, RI; or approved equal.

G. Backflow Preventer: As specified in Section 15400.

2.3 PIPING ACCESSORIES

A. Pressure Gauges: 4-1/2-inch dial, water service, bronze bourdon tube movement, cast aluminum case, white face, black numbers, with gauge cock. Range at two times working pressure. Ametek, U.S. Gauge Division, Sellersville, PA, or approved equal.

B. Thermometers:

1. Red-reading tube, cast aluminum case, and separable sockets, including cap and chain. 9-inch scales in mechanical equipment areas and on main piping; 7-inch scales in other locations. Accuracy shall be plus or minus 1 percent of range span. Vari-Angle by Weiss Instruments, West Babylon, NY, or approved equal.

2. Ranges as follows:

Heating Water	30 to 300 degrees F	1 degree scale divisions
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3. For thermometers and wells through insulation, provide extensions to compensate for insulation thickness.

C. Test Taps: Combination pressure and temperature test taps consisting of 1/4-inch or 1/2-inch nickel plated brass body, MPT fitting designed to receive either temperature or pressure probe, and gasketed and threaded cap with retention chain. Fittings shall be Pete's Plug, manufactured by Peterson Engineering Company, Richardson, TX, or approved equal.

D. Air Vents:

1. Manual: Bronze body and nonferrous internal parts, 150 psig working pressure, 225 degree F operating temperature. Vent manually operated with screwdriver or thumbscrew. Vent shall have 1/8-inch discharge connection and 1/2-inch inlet connection.

2. Automatic: Float type vent designed to vent automatically; bronze body and nonferrous internal parts. 150 psig working pressure, 240 degree F operating temperature. 1/4 inch discharge connection and 1/2-inch inlet connection.

E. Drain Pans: Minimum 18-gauge stainless steel, reinforced to support weight of drain pan and water.

2.4 EXPANSION LOOP GUIDES

A. Factory fabricated cast steel, consisting of bolted two-section outer cylinder and base. Provide two-section alignment guide spider that bolts tightly to pipe.

2.5 AIR SEPARATOR

A. In-Line Air Separator: Heavy duty cast iron air separator constructed for 175 psi minimum working pressure and 300 degree F. Air separator shall have an integral weir to maximize air separation. Separator shall have top outlet connection for air vent and bottom connection for expansion tank. Separator shall be as detailed in drawings.

2.6 DIAPHRAGM EXPANSION TANK

A. Welded steel tank suitable for 125 psig working pressure and 350 degrees F maximum operating temperature. Separate air charge from system water by means of a flexible diaphragm sealed into

tank. Tank shall have taps for pressure gauge, air charge fitting, and drain. Tank shall be constructed, tested, and labeled in accordance with ASME Pressure Vessel Code. Tank shall be as detailed in drawings.

2.7 STRAINERS

- A. Wye Pattern Strainers: 125 psig working pressure, cast iron or bronze construction, complete with removable Type 304 stainless steel basket with minimum perforations of 1/8-inch diameter, and bottom drain connection. Sarco Company, Inc., Allentown, PA, or approved equal.

PART 3 EXECUTION

3.1 PIPE APPLICATIONS

A. Copper Pipe:

1. Install Type L copper pipe with wrought copper fittings and solder joints for 2-inch and smaller pipe, above ground, within building.
2. Install Type K copper pipe for 2 inch and smaller pipe below ground.

B. Steel Pipe:

1. Threaded Joints: Install steel pipe with threaded joints and fittings for 2-inch and smaller in exposed locations such as mechanical rooms.
2. Welded and Flanged Joints: Install welded fittings on pipe 2-1/2 inches and larger.
3. Grooved Couplings and Mechanical Fittings: Install mechanical grooved end pipe on condenser water piping.

3.2 PIPING INSTALLATION, GENERAL

- A. Arrange piping in horizontal groups, each group to be in one plane. Maintain required slope. Conceal pipe installations in walls, pipe chases, utility spaces, mechanical rooms, above ceilings, below grade or floors.
- B. Install piping parallel to permanent elements of building. Provide space to permit insulation applications, with 1-inch clearance outside insulation. Provide 2-inch space above removable ceiling panels to allow for panel removal.
- C. Sloping, Air Venting, and Draining:
 1. Install piping true to line and grade, and free of traps and air pockets. Slope piping up in direction of flow at 0.2 percent grade.
 2. Provide eccentric reducers for changes in horizontal piping, top side flat.
 3. Connect branch piping to bottom of mains, except for up-feed risers which shall have take-off out top of main.
 4. Install manual air vents at high points in hydronic piping systems and at coils other than air handling units. Provide 1/4-inch copper, 180-degree bend pipe to discharge vented water into can.

5. Install automatic air vent on air separator. Provide valved inlet and discharge piped to floor drain.
 6. Install drain valves with hose adapters at low points in mains, risers, and branch lines. Drain shall consist of a tee fitting, 3/4-inch ball valve, and short 3/4-inch threaded nipple and cap. Provide drain valves for float type controllers.
- D. Fittings: Standard manufactured fittings. Field fabricated fittings and bushings are prohibited on all piping.
 - E. Unions: Install unions in pipes 2-inch and smaller, adjacent to each valve, at final connections of each piece of equipment and elsewhere to permit alterations and repairs. Install dielectric unions to join dissimilar metals. Unions are not required on flanged devices.
 - F. Flanges: Install flanges on valves and equipment having 2-1/2-inch and larger connections.
 - G. Pipe Ends: Cut pipe and prepare ends with full inside diameter. Deburr and size.
 - H. Joints:
 1. Threaded Joints: Apply Teflon tape to male equipment threads. Do not use pipe with threads which are corroded or damaged.
 2. Soldered Joints: Comply with procedures contained in AWS Soldering Manual. Clean surfaces to be joined of oil, grease, rust, and oxides. Clean socket of fitting and end of pipe with emery cloth. After cleaning and before assembly or heating, apply flux to joint surface and spread evenly.
 - I. Keep openings in piping closed during construction to prevent entrance of foreign matter.
 - J. Install flexible connectors at inlet and discharge connections to base-mounted pumps and other vibration producing equipment.

3.3 VALVES

- A. Field check valves for packing and lubricant. Replace leaking packing. Service valves with lubricant for smooth and proper operation before placing in service.
- B. Install valves accessible from floor level, located for easy access. Install valves in horizontal piping with stem at or above center of pipe. Install valves in position to allow full stem movement. Provide operating handles for valves and cocks without integral operators.
- C. Provide extended valve stems where insulation is specified.
- D. Provide separate support where necessary.
- E. Do not use valves with soldered ends for heating water piping applications.
- F. Where soldered end connections are used for valves, use solder having a melting point below 840 degrees F for gate, globe, and check valves; below 421 degrees F for ball valves.
- G. Provide valves same size as line size.

- H. Provide gate blowdown valves and hose adapters at strainers; same size as strainer blowoff connection.
- I. Check Valves: Install check valves for proper direction of flow as follows:
 - 1. Swing Check Valve: Horizontal position with hinge pin level.

3.4 EQUIPMENT PIPING

- A. Provide combination balancing and shutoff valves to regulate water flow through piping, coils, and at other equipment and piping where shown or required for proportioning flow.
- B. Install automatic fill valve in cold water make-up to boilers. Install three valve bypass with globe valve around automatic fill valve for quick filling system. Install backflow preventer upstream of fill valve and bypass.

3.5 PRESSURE GAUGES

- A. Install pressure gauges in piping tees with pressure gauge valve located on pipe in readable position.

3.6 THERMOMETERS

- A. Install with brass separable sockets of proper length to ensure accurate reading and extension necks to suit insulation thickness.
- B. Install thermometer wells in vertical position in piping tees where thermometers are indicated. Install wells with stem extending to center of pipe. Extension necks shall suit insulation thickness. Fill wells with oil or graphite and secure caps.

3.7 EXPANSION LOOPS, GUIDES, AND ANCHORS

- A. Install piping with provisions for expansion and contraction, using expansion loops. Provide for expansion and contraction in mains, risers, and runouts. Install pipe expansion loops cold-sprung in tension for piping with operating temperatures higher than installed temperature and compression for piping with operating temperatures lower than installed temperatures. Install pipe to absorb 50 percent of total compression or tension produced during anticipated change in temperature. Do not bend piping without use of bending machine.
- B. Install guides to properly direct pipe movement into expansion loops and offsets.
- C. Install anchors to control movement in piping. Weld anchors to ferrous piping and braze anchors to nonferrous piping. Install pipe anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops.
- D. Install in accordance with standards of EJMA.
- E. Connect risers to mains with at least five pipe fittings including tee in main. Connect risers to terminal units with at least four pipe fittings including tee in riser.

3.8 STRAINERS

- A. Install strainers on supply side of each control valve, pressure reducing or regulating valve, solenoid valve, inline pump and as shown. Install nipple and ball valve in blow down connection of strainers 2-inch and larger.

3.9 DRAIN PANS

- A. Provide drain pans under the entire length of any piping, including valves, joints, and fittings for any liquid carrying piping system installed over any motor, motor starter, switch gear, transformer, or other electrical equipment and under all such piping located anywhere in any transformer vault, electrical switchboard room, and telephone equipment room. Drain pans shall be not less than 2 inches deep, with a 3/4-inch drain pipe to discharge where shown or to discharge at nearest convenient drain line, floor drain, or other approved drain point.

3.10 EXPANSION TANK AND AIR SEPARATOR INSTALLATION

- A. Install tanks as shown; locate appurtenances for easy servicing.
- B. Install gate valve and union on air separator drain to facilitate removal of strainer. Route discharge on air separator tank to nearest drain.
- C. Check expansion tank after cleaning, testing, and filling of system to ensure system is completely full.
- D. Provide bracket supports, saddles, and hangers to support tanks.
- E. Install air separator level in both directions, supported from the structure so that all pipe can be removed without moving tank.
- F. Charge the expansion tank with proper air charge.

3.11 TESTING

- A. Test piping systems using ambient temperature water, except where there is risk of damage due to freezing.
- B. Release trapped air while filling system using vents at high points. Use drains installed at low points for complete removal of liquid.
- C. Isolate equipment and parts that cannot withstand test pressures.
- D. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test.
- E. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components and repeat hydrostatic test until there are no leaks.
- F. Prepare written report of testing, indicating locations of leaks corrected, method used to correct leaks, number of tests required, and certification that system is leak free.

3.12 TRAINING

- A. Provide up to one hour of instruction on hydronic systems. Include following items as a minimum:
1. Location of automatic and manual air vents.
 2. Location of strainers and blow down valves.
 3. Location of safety and relief valves.
 4. System drain valves.
 5. System fill and associated devices.
 6. Expansion tank and air separator.

END OF SECTION

SECTION 15510

BOILERS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of furnishing and installing boilers and associated equipment.

1.2 RELATED WORK

- A. Hydronics - Section 15500.
- B. Hydronic Terminal Heating Equipment - Section 15760.

1.3 QUALITY ASSURANCE

- A. Electrical components shall comply with NFPA 70 and be UL listed.
- B. Boilers shall comply with ASME Boiler and Pressure Vessel Code, Section IV.
- C. Boilers tested and rated according to the Hydronics Institute's "Testing and Rating Standard for Heating Boilers" with I=B=R emblem on a nameplate.

1.4 SUBMITTALS

- A. As specified in Section 01330.
- B. Submit manufacturer's data including physical dimensions, rated capacities, weights and accessories for boilers.
- C. Submit wiring diagrams detailing wiring for power and control systems differentiating between factory and field installed wiring.

1.5 CLOSEOUT SUBMITTALS

- A. As specified in Section 01770.
- B. Operation and maintenance data for review and approval as required by Section 01785.
 - 1. Submit operation and maintenance data for boilers, including accessories and as-built wiring diagrams.
- C. Combustion Tests and Inspection Report: Copy of test results for compliance with performance requirements.
- D. Warranty: Manufacturer's standard warranty of not less than 10 years.

PART 2 PRODUCTS

2.1 CONDENSING BOILERS

- A. Factory assembled and tested modules include combustion air inlet chamber, prepurge and postpurge blower assembly, air-gas fuel control valve, combustion chamber, heat exchanger, and exhaust. Insulated jacket around module and unit mounted electrical control panel with operation sequence indicator lights.
- B. Type: Sealed-combustion, gas fired, condensing type hot water boiler with capacities and accessories as per accepted proposal. Ultra Series as manufactured by Weil-McLain or approved equal.
- C. Fuel: Propane.
- D. Controls:
 - 1. Controller: Solid state, with pressure-sensing flame safeguard system, ignition transformer, spark plug, manual gas shutoff valve, system pressure controlled regulator, automatic redundant control valves, high limit water temperature controller, ASME-approved safety-relief and temperature and pressure gauge.
- E. Accessories:
 - 1. Exhaust mufflers.
 - 2. Air-supply mufflers.
 - 3. Low water cutoff and manual reset high limit control.
 - 4. Vent terminal plates.

2.2 FLUE

- A. Air Intake and Exhaust Piping: UL 1738, non-metallic gas vent for use with Category III or IV gas appliances having flue gas temperatures less than 480 degrees F.
 - 1. Adhesive: High temperature adhesive/sealant.

2.3 CONTROLS

- A. UL listed, electronic boiler control with adjustable reset ratios, adjustable offset to raise or lower reset curve, adjustable outdoor cutoff, night set back, minimum boiler water temperature adjustment, setback clock and adjustable morning warm up, manual override, LED indication of Setback, Bypass and On. Integral to the system or Heat-trol model 100 by Heat-Timer, Fairfield, NJ, or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install boilers level and plumb, according to manufacturer's recommendations.
- B. Install boilers on 4-inch thick concrete bases, 4 inches larger on each side than base of unit or wall hang with manufacturer supplied kits on walls not adjacent with bed rooms.
- C. Install propane gas-fired boilers according to NFPA 58.

3.2 CONNECTIONS

- A. Install propane piping as specified in Section 15198. Connect gas piping full size to boiler gas train inlet. Install with a union and dirt leg.
- B. Install heating water piping as specified in Section 15500. Connect to boiler with shutoff valve and union or flange at each connection.
- C. Install piping from safety relief valve to nearest floor drain or outside.

3.3 CONDENSING BOILERS

- A. Connect air intake and exhaust piping to boiler, size as recommended by manufacturer. Pitch toward boiler minimum of 2 percent.

3.4 CONTROLS

- A. Wire boiler burner so it cannot fire unless heating water circulating pump is running.
- B. Boiler shall be started and stopped automatically through the boiler control panel. Outdoor temperature sensor shall enable reset of heating water temperature in accordance with the following schedule:

Outdoor Air Temperature	Heating Water Temperature
70 degrees F	140 degrees F
0 degrees F	190 degrees F

- C. Wire boiler burner through flow switch in heating water loop to prevent boiler operation until positive flow is proven.
- D. Low water cutoff switch shall shut down boiler operation when water level drops below limit.
- E. Automatic high limit shall shut down boiler operation when water temperature exceeds 200 degrees F (adjustable). Manual reset high limit shall shut down boiler operation when water temperature exceeds 205 degrees F (adjustable).
- F. Install emergency shutdown switch near boiler room exit door. Wire switch through the burner controls.

3.5 CLEANING

- A. Flush and clean boilers according to manufacturer's instructions.
- B. After completing system installation, inspect boiler and associated components. Repair scratches and mars on finish to match original finish.
- C. Clean breeching internally to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth.

3.6 TESTING, ADJUSTING, AND BALANCING

- A. As specified in Section 15952.
- B. Complete manufacturer's installation and startup checklist.
- C. Test boiler performance and adjust boiler combustion efficiency to meet manufacturer's recommendations.
 - 1. Measure and record the following :
 - a. Gas pressure on manifold.
 - b. Combustion air temperature at inlet to burner.
 - c. Flue gas temperature at boiler discharge.
 - d. Flue gas carbon dioxide and oxygen concentration
 - e. Natural flue draft.

3.7 TRAINING

- A. Provide 1 hour of instruction to Government personnel. Include operation of boiler including accessories and controls, procedures for startup and shutdown, troubleshooting, servicing, and preventive maintenance.

END OF SECTION

SECTION 15760

HYDRONIC TERMINAL HEATING UNITS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of furnishing and installing hydronic terminal heating units and related appurtenances for heating.

1.2 RELATED WORK:

- A. Hydronic systems - Section 15500.
- B. Testing, adjusting, and balancing - Section 15952.

1.3 SUBMITTALS

- A. As specified in Section 01330.
- B. Manufacturer's literature and installation instructions for each type of terminal heat transfer unit as follows:
 - 1. Finned tube baseboard.
- C. Color sample of finned tube radiation enclosure for selection and approval.

PART 2 PRODUCTS

2.1 FINNED-TUBE RADIATION UNITS

- A. As detailed in drawings or approved equal.

2.2 THERMOSTAT

- A. Low Voltage heating thermostat as detailed in drawings.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install equipment in accordance with manufacturer's recommendations.

3.2 BASEBOARD AND FIN-TUBE RADIATION

- A. Install units level and plumb, in accordance with manufacturer's instructions.
- B. Center units under windows.
- C. Install continuously around corners using manufacturer's outside and inside corner fittings.

- D. Join with manufacturer's splicer sets to provide continuous cabinet.
- E. Install manufacturer's access fitting in cabinets for access to valves and fittings.
- F. Use manufacturer's filler pieces and end caps.
- G. Install air-seal gasketing on finned tube radiation units between wall and enclosure mounting channel.

3.3 TESTING, ADJUSTING, AND BALANCING

- A. As specified in Section 15952.

3.4 CLEANING

- A. After completing system installation, inspect exposed finish. Remove burrs, dirt, and construction debris; repair damaged finishes.

END OF SECTION

SECTION 15952

TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of testing, adjusting, and balancing air, fluid, mechanical, control, and electrical systems associated with HVAC systems to optimum performance.

1.2 CODES AND STANDARDS

- A. Test, adjust, and balance systems in accordance with ASHRAE Applications Handbook. For NEBB certification, comply with "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems". For AABC certification, comply with "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems".

1.3 RELATED WORK

- A. Hydronic Systems - Section 15500.

1.4 QUALIFICATIONS:

- A. Testing, adjusting, and balancing personnel must be certified by NEBB or AABC in testing and balancing disciplines required for this project.

1.5 SUBMITTALS

- A. As specified in Section 01330.
- B. Balancing and Testing Plan: Submit balancing and testing plan which includes procedures, instructions, and reports to be used.
- C. Calibration Reports: Submit proof that instrumentation has been calibrated, to tolerances specified in referenced standards, within a period of six months before starting project.

PART 2 PRODUCTS

2.1 TEST INSTRUMENTS AND EQUIPMENT

- A. Provide all test instruments, meters, gauges, thermometers, power measuring instruments, pumping equipment, temporary piping, fittings, wiring, wiring devices, and miscellaneous items necessary to perform required testing procedures.

2.2 ACCESSORY DEVICES

- A. Provide necessary dampers, thermometer wells, gauge cocks, balancing valves, and other appurtenances as required. Coordinate locations of these items as construction progresses, to avoid disturbance of finished complete systems. Provide new sheaves and belts for air moving equipment, if required, to attain desired air quantities.

PART 3 EXECUTION

3.1 GENERAL

- A. Pre-Balancing Conference: Before beginning testing, adjusting, and balancing procedures, schedule and conduct a conference with the Contracting Officer's Representative and representatives of installers of mechanical and control systems. Conference objective is final coordination and verification of system operation and readiness for testing, adjusting, and balancing, and assigning testing responsibilities of each installer.
- B. Systems shall be complete and fully operational prior to beginning procedures. Insure all items such as thermometer wells, pressure test cocks, access doors, etc., are installed to facilitate tests and adjustments.
- C. Put all heating systems and equipment into full operation and continue operation during testing and balancing.
- D. Before hydronic balance work is started, check system for plugged strainers, proper pump rotation, and proper control valve installation and operation; check air vents at high points of systems and ensure all are installed and operating freely (automatic type) or bleed air completely (manual type); and verify proper flow meter and check valve installation and proper system pressure.
- E. All throttling devices and control valves shall be set open.

3.2 PERFORMING TESTING, ADJUSTING, AND BALANCING

- A. Cut insulation, and piping for installation of test probes to minimum extent necessary to allow adequate performance of procedures.
- B. Patch insulation and housings, using materials identical to those removed.
- C. Seal piping, and test for and repair leaks.
- D. Seal insulation to re-establish integrity of the vapor barrier.
- E. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other permanent identification materials.
- F. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.3 SEQUENCING AND SCHEDULING

- A. Systems shall be fully operational before beginning procedures.
- B. Conduct tests in the presence of the Contracting Officer's Representative after providing 48-hour notice before any test is to be conducted. Provide water and electricity required for tests. Determine that all valves are in a set or full open position.

3.4 BALANCING

- A. Water Balance:

JULY 2008

SCHOODIC SHORES APARTMENTS HEAT

15952-2

TESTING, ADJUSTING, AND BALANCING

1. Balance water piping systems to produce water quantities within 10 percent of design flow rates for heating water systems.
 2. Hydronic systems shall be proportionally balanced, ensuring the path to one terminal is fully open. Total system flow shall be adjusted at pump by restricting discharge balancing valve.
 3. Indicate and record final position of balancing valves.
 4. Primary-Secondary Flow Systems: Balance primary system crossover flow first, then balance secondary system.
 5. Pumps:
 - a. Verify pump impeller size and pump rotation.
 - b. Measure flow.
 - c. Measure inlet and outlet pressures.
 - d. Measure motor full load amperage at design flow and shut-off condition.
 6. Boilers:
 - a. Measure entering and exiting water temperatures and pressures.
 - b. Measure gas flow rate.
 - c. Measure water flow.
 - d. Calculate capacity in Btuh.
 7. Finned Tube Radiation:
 - a. Measure entering and exiting water temperatures.
 - b. Measure water flow rate.
 - c. Calculate capacity in Btuh.
- B. Temperature Control System: Inspect temperature control systems for proper sequence of operation and approximate calibration. Report any deficiencies. Include written certificate in balance report that temperature controls function properly.
1. Verify proper operation of devices. Verify that all controllers are calibrated and operational.
 2. Check location of transmitters and controllers. Note adverse conditions that would affect control and suggest relocation as necessary to the Contracting Officer's Representative.
 3. Note settings on controllers. Note discrepancies between set point for controller and actual measured variable.

4. Verify operation of all limiting controllers, positioners, and relays (e.g., high and low temperature thermostats, high and low differential pressure switches, etc.).
 5. Activate controlled devices, checking for free travel and proper operation of stroke for dampers and valves. Verify and note normally open (NO) or normally closed (NC) operation.
 6. Verify sequence of operation of controlled devices. Note line pressures and controlled device positions. Correlate to air or water flow measurements. Note speed of response to step change.
 7. Confirm interaction of electrically operated switch transducers.
 8. Confirm interaction of interlock and lockout systems.
- C. After deficiencies are corrected, retest the temperature control system.

3.5 REPORT

- A. Report Format: Standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Include information indicated on standard report forms prepared by AABC or NEBB for each respective item and system, and schematic diagrams for each system or piece of equipment to accompany each respective report form. Bind report forms complete with schematic systems diagrams and other data in reinforced vinyl three-ring binders. Provide binding edge labels with project identification and a title descriptive of contents. Divide contents of binder into following divisions, separated by divider tabs:
1. General Information and Summary
 2. Hydronic Systems
 3. Temperature Control Systems
- B. Report Contents: Provide following minimum information, forms, and data:
1. General Information and Summary:
 - a. Inside cover sheet to identify testing, adjusting, and balancing agency, contractor, and project name. Include contact names, addresses, and telephone numbers.
 - b. Certification sheet containing seal, address, telephone number, and signature of Certified Tester.
 - c. Listing of instrumentation used for procedures along with proof of calibration.
- C. Test Data: Report shall include the following data, in addition to certified field report readings taken during the balancing and testing operations. Include required or specified reading, first reading taken, and final balanced reading.
1. Hydronic Balance:
 - a. Water coil size and manufacturer.

- b. Boiler and burner nameplate information and flue gas analysis. Flue gas analysis shall be copy of manufacturer's analysis report.
- c. Pump and motor nameplate information. Include manufacturer's pump curves.
- d. Heat exchanger nameplate information.

3.6 PERFORMANCE TESTS

- A. After cleaning, pressure tests, adjusting, and balancing are complete, each system shall be performance tested as a whole to verify that all items perform as integral parts of system, and temperatures and conditions are evenly controlled throughout building.

END OF SECTION

SECTION 16010

GENERAL ELECTRICAL PROVISIONS

PART 1 GENERAL

1.1 DESCRIPTION

- A. This section includes basic requirements of a common or administrative nature that pertain to all electrical work.

1.2 WORK INCLUDED

- A. As specified and as shown, furnish, install, test, and place in satisfactory and successful operation all equipment, materials, devices, and necessary appurtenances to provide a complete and operable electrical system. Electrical work also includes wiring and connections required for electrical equipment furnished under other divisions, including fans and heating systems.

1.3 RELATED REQUIREMENTS

- A. Temporary electrical work - Section 01510. For additional basic requirements that may affect electrical work, see Division 1.

1.4 QUALITY ASSURANCE

- A. Worker's Qualifications: All electrical work shall be performed by licensed electricians or under the direct supervision of a licensed electrician.

- B. Codes and Regulations:

1. All work shall meet requirements of governing codes and regulations, NFPA 70, (NEC), and NESC.
2. Advise the Contracting Officer of conflicting codes or conflicts between codes and drawings and specifications.
3. When the requirements of specifications or drawings are more stringent than the codes, regulations, or standards, the specifications or drawings shall prevail.
4. The electrical installation shall meet the requirements of NECA Standard of Installation, except where otherwise specified.

- C. UL Listing:

1. All electrical materials and equipment shall meet requirements of the applicable standards of UL if UL standards exist for such materials and equipment.
2. The UL authorized listing mark is acceptable as evidence that the materials meet this requirement.
3. In lieu of UL authorized listing mark, the Contractor may submit independent proof satisfactory to the Contracting Officer that the materials meet the standards.

4. Materials and equipment shall be installed only for their intended operational purpose.
- D. Standard Products: Provide only new electrical equipment of current standard design.
- E. Finished Surfaces:
 1. Finished surfaces of existing facilities that are marred, scratched, or damaged shall be refinished to match original condition.
 2. Building surfaces that have been altered for the proper installation of electrical equipment shall be restored by skilled personnel of the trades involved at no additional expense to the Government.
- F. Polychlorinated Biphenyl (PCB): Equipment containing PCB is not acceptable.

1.5 INTENT OF CONSTRUCTION DRAWINGS

- A. Electrical drawings do not attempt to show complete details of building construction that affect installation. Diagrams are schematic only and do not necessarily show physical arrangement of equipment. Refer to drawings of other trades for additional details which affect work.
- B. Conduit, conductor and ground connections are shown diagrammatically only. Layout does not necessarily show total number of conduits or conductors for circuits required and should not be used for obtaining quantities for linear runs of conduits or wires. Locations of indicated runs are not intended to show actual routing of conduits. Provide additional conduits and wire wherever needed to complete installation of specific equipment furnished.
- C. Locations of outlets on drawings are approximate and may be distorted for clarity in representation.
- D. Install electrical outlets and other equipment clear of and in proper relation to radiators, ducts, grilles, pipes, and other equipment, and items such as cabinets and counters.
- E. Changes such as offsetting conduit runs, moving outlets, or other minor changes necessary to facilitate installation shall be made at no additional expense to the Government.

1.6 COORDINATION OF WORK

- A. Coordinate electrical work with the work of the various trades on the project.

PART 2 PRODUCTS NOT USED.

PART 3 EXECUTION

3.1 INSPECTION

- A. Demonstrate that electrical work operates satisfactorily and in accordance with the requirements of the drawings and specifications. Before final inspection, remove the front covers on all panelboards, and wire gutters. Replace covers after the final inspection is completed.

3.2 TESTING

- A. General:

- 1. Make all specified tests in the presence of the Contracting Officer.
 - 2. Furnish all instruments and provide qualified personnel to perform all tests in accordance with the drawings and specifications.
 - 3. Perform all tests at no additional expense to the Government.
 - 4. Operate all electrical equipment within the ranges specified by manufacturer.
 - 5. Correct defects revealed by the tests.

- B. Balance Test: Test for proper load balance on the system, and make adjustments as required.

- C. Conductors: Prior to energization of circuitry, test installed wires and cables to ensure that insulation resistance levels are adequate, test wires and cables for electrical continuity and for short-circuits.

- D. Wiring devices: Ensure proper polarity of connections. Prior to system energization, test wiring devices in accordance with manufacturer's recommendations.

- E. Grounding:

- 1. Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester.
 - 2. Where test shows resistance-to-ground is over 25 ohms, reduce resistance to 25 ohms or less by driving additional ground rods; then retest to demonstrate compliance.

- F. Panelboards and Load Centers:

- 1. Prior to energization of circuitry, check all accessible connections to manufacturer's torque tightening specifications.
 - 2. Prior to energization of panelboards or load centers, check phase-to-phase and phase-to-ground insulation resistance with ground resistance tester.

- G. Lighting Fixtures and Lighting System: Upon completion of installation and testing of lighting fixtures replace any defective ballasts, contactors, control devices or burned out lamps.

3.3 DEMONSTRATION

- A. As specified in individual sections of Division 16.

3.4 EXISTING EQUIPMENT AND WIRING

- A. Surface Wiring Systems to be Abandoned: Remove conduit, wire, boxes, and other components to nearest outlet, device, or panelboard that is to remain in use.
- B. Concealed Wiring Systems to be Abandoned: Remove wire, devices, and other components to nearest outlet, device, or panelboard that is to remain in use. Install blank faceplates on abandoned outlet boxes.
- C. Modify existing electrical installation as required by new construction. Provide necessary conduit system, wire, and connections for a complete and operable system.
- D. Removing Existing Equipment: Existing equipment specified to be removed becomes property of Contractor and shall be removed from site, unless otherwise specified.

END OF SECTION

SECTION 16050

BASIC MATERIALS AND METHODS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section consists of general electrical materials and methods. Electrical materials that are a part of equipment specified under other sections shall meet the requirements of this section, unless part of larger factory-assembled equipment.

1.2 QUALITY ASSURANCE

- A. NFPA 70 for components and installation.
- B. Provide products that are UL listed and labeled.

PART 2 PRODUCTS

2.1 WIRE AND CABLE

- A. Color Coding:
 - 1. Color code secondary service conductors for the entire electrical system. For three phase delta secondary voltages where the midpoint of one phase is grounded, the conductor having the higher voltage to ground shall be orange. For single phase voltages, black and red for phases, white for neutral; and green for ground. Neutral and equipment grounding conductors sized No. 6 AWG and larger may be marked with colored plastic marking tape at each end and at every point where wire is accessible; conductors sized smaller than No. 6 AWG shall be color coded.
- B. Branch and Feeder Circuits:
 - 1. Conductor insulation shall be rated for 600 volts.
 - 2. Conductor size shall meet requirements of NFPA 70-96, or the sizes shown on the drawings if larger, and for feeder and branch circuits shall be No. 12 AWG minimum.
 - 3. Wire sizes are for copper.
 - 4. Copper clad and aluminum conductors are not acceptable.
- C. Building Wiring:
 - 1. Feeder and Branch Circuits: Wiring shall be type NM, minimum 12 AWG.
 - 2. Low Voltage Control Cable: Cable shall have 18 AWG copper conductors. Insulation shall be rated for 150 volts minimum. Conductors shall be twisted and have thermoplastic jacket.
- D. Underground Wiring: None.

2.2 OUTLET, PULL, AND JUNCTION BOXES

1. General: Provide one for each outlet, switch, receptacle, or combination, and each junction point.

2.3 WIRING DEVICES

- A. Receptacles: UL 498-91 and NEMA WD-1-83. Terminals shall be suitable for copper conductors.
 1. Duplex Receptacles: Thermosetting ivory plastic, NEMA heavy duty 5-15R and 5-20R configurations, Specification grade with U-shaped grounding pole and a green-colored terminal for connection of a bonding jumper.
 2. Ground Fault Circuit Interrupter Receptacle (GFCI): Duplex 20-ampere with NEMA 5-20R configuration, UL 943-95, Class A, Specification grade. Receptacle shall have built-in surge and load noise suppression, with feed-through capability to protect branch circuit beyond GFCI receptacle against ground fault, and test and reset buttons. Indicator light shall glow only when tripped. Color shall be ivory
- B. Snap Switches: Specification grade, 15-ampere, 120/277 volts, ac rated, general use, quiet type, NEMA heavy duty, with ivory handle, key operated where shown. Screw terminals sized for No. 10 AWG copper.
- C. Device Plates and Covers: One-piece, with matching countersunk screws, as follows:
 1. Indoor Finished Areas: ivory.
 2. Wet Locations: Gasketed and weatherproof, with spring covers for receptacles, lever operators for switches, and cast aluminum cover plates for junction boxes.

2.4 SAFETY SWITCHES

- A. Quick-make, quick-break, NEMA type HD heavy duty switches. Switches shall have interrupting rating equal to or greater than interrupting rating of its fuses and the system short circuit capacity at the point of each application. Voltage ratings shall be that of the system voltage at point of application.

2.5 INDIVIDUALLY ENCLOSED CIRCUIT BREAKERS

- A. Size, rating, and number of poles shown, thermal-magnetic, ambient-compensated, common trip. Provide means for padlocking the handle in the OFF position.

2.6 NAMEPLATES, LEGEND PLATES AND WIRE MARKERS.

- A. Nameplates: Laminated sheet plastic, approximately 1/16-inch-thick, with engraved white letters on a black background, with adhesive backing and mounting-screw holes. Minimum height of letters, 5/16 inch. Card holders are not acceptable.
- B. Legend Plates: NEMA Type KN-3 standard legend plates.
- C. Wire Markers: Pressure-sensitive or heat shrink sleeve types.

PART 3 EXECUTION

3.1 WIRE AND CABLE

- A. Taps and Splices: Permitted only in junction or outlet boxes. Use only copper insulated-wire connectors, bolted and taped connectors, or crimp connectors.

3.2 WIRING DEVICES, OUTLET AND JUNCTION BOXES

- A. Mounting Heights to Centerline of outlet box or receptacle:
 - 1. Receptacles: 18 inches above floor or ground, except as specified below.
 - a. Above Kitchen Counters: 4 inches above countertops or backsplashes, or 46 inches above floor, whichever is higher.
 - b. Mechanical Rooms: 46 inches above floor.
 - c. Clocks: 7 feet above floor.
 - d. Special Purpose Receptacles: As shown.
 - 2. Switches and Combination Switch/Receptacles: 48 inches above floor.
- B. Install light switches on strike side of doors.
- C. Install single receptacles and switches with a minimum of 6 inches separation. Through-the-wall type handy boxes are not permitted.
- D. Install floor outlets with cover plates flush with top of finished floor adjust for carpeted areas.
- E. Remove fiber washers on mounting screws before installing device. Ground receptacles to metal boxes with green grounding jumpers. Mounting and terminal screws shall be tight.
- F. Firmly attach plates, plumb and level.

3.3 METAL FRAMING

- A. Install where electrical equipment is to be surface mounted to walls and where shown. Where two or more safety switches, starters, conduits, or similar items are to be installed side by side, support on metal framing, bolt together, and brace as required to form a rigid structure.
- B. Clean cuts and welds. Coat unpainted surfaces with cold application zinc galvanizing. Coat cuts and welds on painted surfaces with zinc chromate primer and finish to match existing paint.

3.4 INDIVIDUALLY ENCLOSED CIRCUIT BREAKERS AND SWITCHES

- A. Install with top of enclosure between 54 inches and 78 inches off ground or floor.

3.5 NAMEPLATES, LEGEND PLATES AND WIRE MARKERS

- A. Nameplates: Identify all panels, motors, motor starters, control points, control centers, disconnect switches, fire alarm junction boxes and time switches. Fasten nameplates with finish screws or rivets.

1. Remotely Mounted Controls: Identify the equipment controlled.
 2. Panels: Identify panel number, feeder number, and voltage of panel bus.
 3. Safety Switches, Relays, and Motor Starters: Identify equipment controlled and circuits from which they are fed.
 4. Motors: Identify motors as shown on drawings.
 5. Fire Alarm Junction Boxes: Identify boxes as "FIRE ALARM JUNCTION BOX"
- B. Legend Plates: Install for all push-buttons, pilot lights, selector switches, and selector push-buttons.
- C. Wire Markers: Install at each end of each wire interconnecting between such items as control panels, sensors, and control devices, and each end of control wires within control panels, motor control centers, and other such controllers. Wiring markers shall correspond to control wire numbers on schematic diagrams.

END OF SECTION